AMERICAN MACHINIST

July 26, 1939

Hands Up—*Operator must hold two safety grips before the press will stamp out another panel (page 553)*

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TO HELP YOU MAKE THE MOST OF YOUR TIME AT THE MACHINE TOOL SHOW

When you go to the Machine-Tool Show this fall, you'll have certain types of equipment in mind—the types you intend to buy next. You'll intend to see all the modern examples of those units at the Show, to form a sound basis for selection.

To walk through the exhibits, depending upon picking up those units as you go, is both risky and time-consuming. You're sure to miss some examples, and to waste precious time finding others. Besides, there will be radically new developments in other lines that you wouldn't want to miss.

To save your time, *American Machinist* is publishing photographs and descriptions of the new machines in its Show Number, out Sept. 20. That will give you a preview two weeks before the Show, to help you plan a "tour". There will be a complete list of exhibitors and their exhibits, as well as a detailed floor plan. Check off your "preferred" visits on the exhibitors' list, then "spot" their booth locations on the floor plan. You'll then have a mapped route that makes certain you don't miss the booths you want most to see.

★

Coming Sept. 20 • Machine Tool Show Number • American Machinist

ESTABLISHED 1877 **AMERICAN MACHINIST** BURNHAM FINNEY, Editor

Garnish Moldings for G.M.

Bending, roll forming and welding are used by the Ternstedt Division to make the trim strips for Fisher body interiors

By HERBERT CHASE

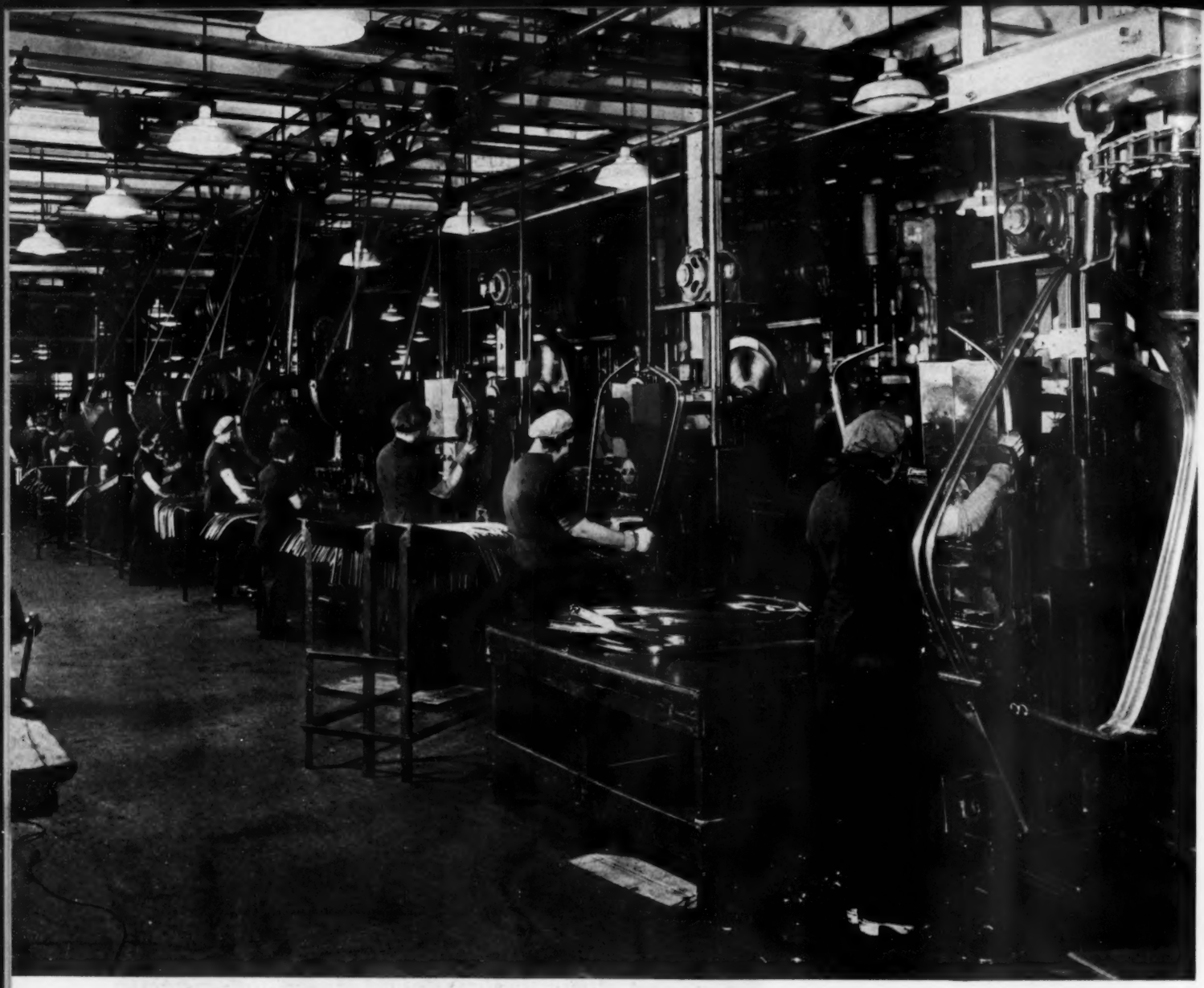
FLEXIBILITY of production operations is a controlling factor in the economic production of garnish moldings by Fisher Body's Ternstedt division. Several types are required for each closed car, and each General Motors car calls for distinctive sizes, shapes and finishes. A typical four-door sedan will require eight complete frames, all different. Most of the frames are of D-shape, but they vary in contour to fit body openings. Also, width and section shape vary for different frames in the same set to a greater or lesser degree.

Moldings for door windows have a uniform rolled section on three sides, but the fourth side is stamped and then joined to the rolled section by welding. Rear-quarter and back windows take moldings rolled from one piece, the single joint being welded. A large variety of dies and other forming tools must be provided to manufacture these various shapes.

Production starts with the rolling of strip-steel stock to refine the surface without forming it. Strips to be roll-formed are then passed between forming rolls and cut to length automatically in a flying cut-off operation. Lengths thus formed are passed down a steel incline to an automatic bending machine.

BENDING of roll-formed strip is done around a steel form of the required size and shape. Its edge is hollowed to fit the convex side of the channel-shaped molding. In the bender one end of the molding strip is clamped to the form, then the form is rotated slowly while a roller applies pressure to force the strip into contact with the form. Continuous application of pressure on the roll prevents any kinks at the bends and the completed piece is perfectly smooth.

(Continued on next page)

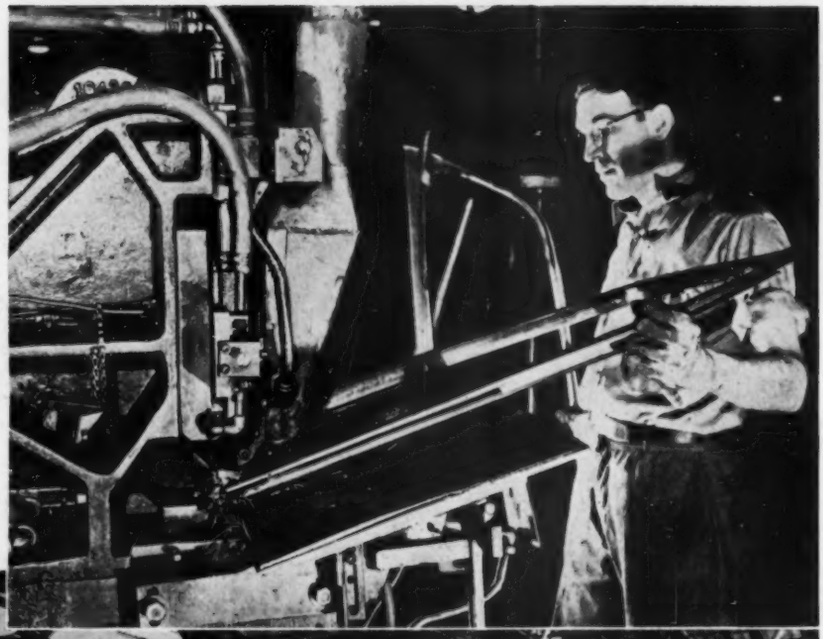


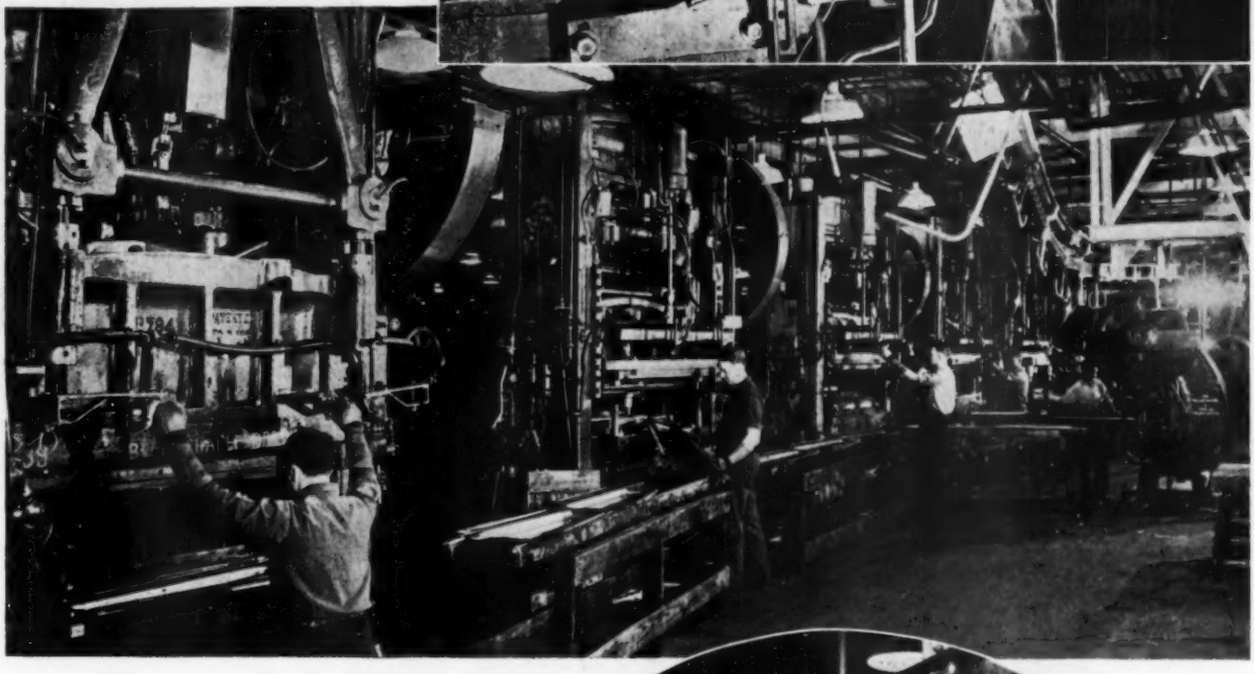
FORMED FRAMES are carried by conveyor to presses where one end is trimmed and both ends are notched for the welding operation. The welding machine employs dies to position the frame ends during the joining operation. Flash is removed by grinding in a special machine. Holes for fastening screws next are pierced and countersunk in press operations. A die then is used to raise the weld section so that it later can be ground flush with adjacent surfaces.

LOOPS are bent and then cut apart, in some instances, to form two open frame sections. The piece to close the D-shaped frame is fabricated separately and frequently includes a skirt that forms a panel below the door window. These panels often are embossed or are pierced to receive plastic or die-cast inserts. All small presses are fitted with cage-like guards to prevent the operator placing a hand in the die.

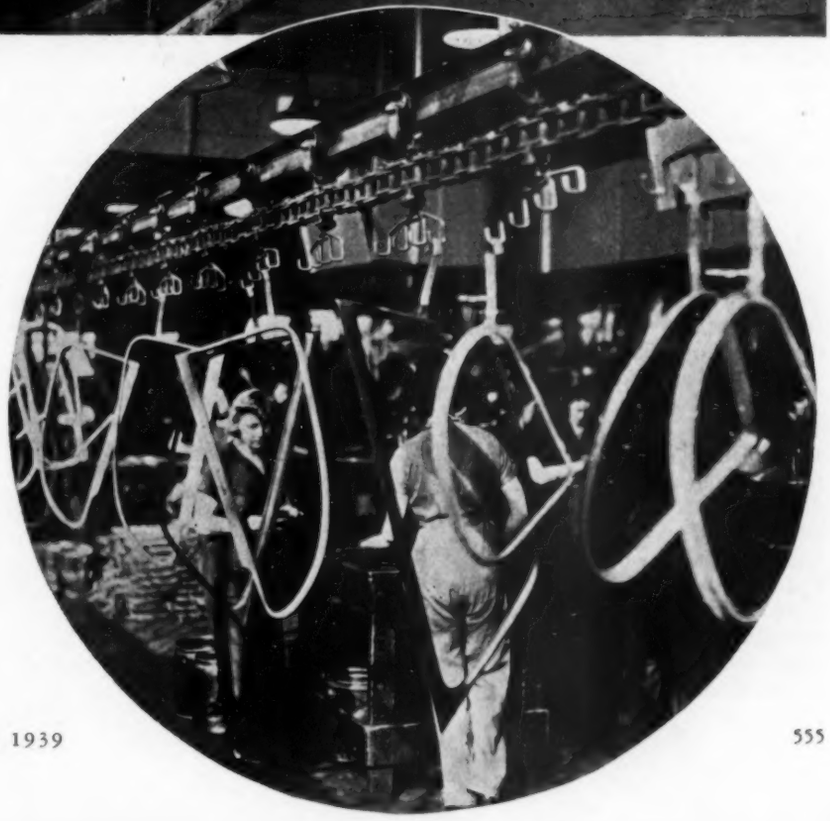
WELDING of joints is performed in automatically controlled machines, after the panels and rolled molding have been formed and trimmed. Door frames require two welds, other window moldings only one. Welding is followed by piercing, countersinking, bumping, grinding and polishing operations. Some frames require clips, which are attached in a foot press.

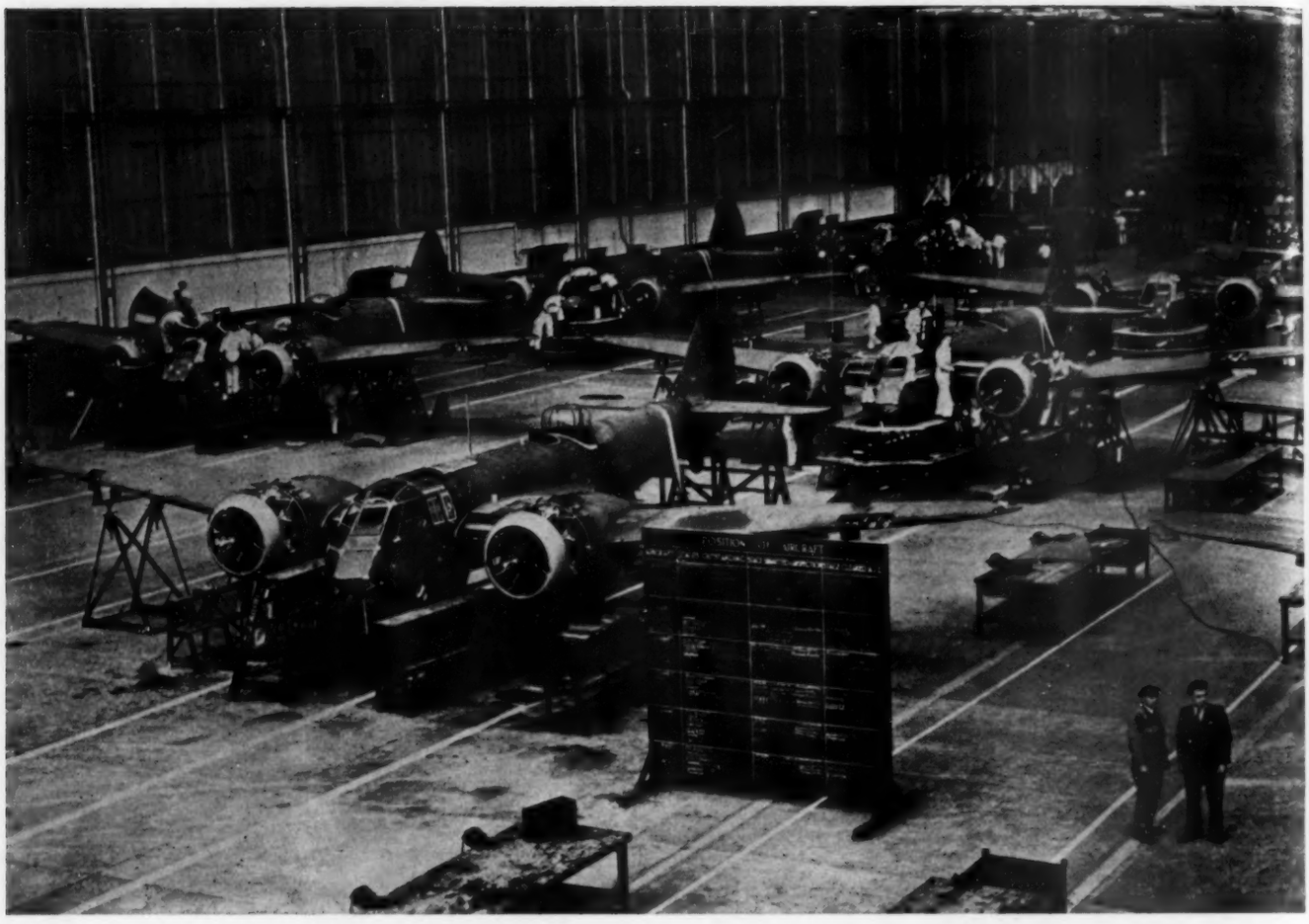
LARGE PRESSES are used for blanking and forming lower panels for door garnish frames. These usually are made in pairs and then cut apart. The presses are equipped with controls that require the use of both hands by each operator so as to insure against accidents. Benches placed between presses provide means for advancing the work from operation to operation.





A CHAIN CONVEYOR carries inspected moldings through a degreaser and then to the finishing department. The ground coat is applied by dipping; it then is baked for 45 min. at 450 F. in a continuous oven which delivers the moldings into an air-conditioned graining room. Gelatine rolls automatically apply the desired design as the molding is passed between rolls, or between the roll and a supporting slide. Some parts require two passes through the rolls. Edges not grained are shade sprayed with a neutral color. After a second bake, moldings are dipped in clear or tinted lacquer and allowed to air-dry for 3 min. A final coat is applied by spraying. Then comes a final bake and a polishing operation. Stripes and decorations are added later. The moldings then go to assembly benches where pile fabric strips are fitted.





Britain's Ready in the Air

(*Special Correspondence to* American Machinist)

LONDON—England's airplane production has caught up with Germany's. Output today is estimated at 600–700 planes a month, with the total rapidly expanding. After allowance is made for exaggerated claims, it is believed that Germany's plane manufacture is no higher than England's.

Estimates have been made that current German output is as much as 1,000 planes a month, but these are attributed to "scare" propaganda which Germany so effectively has disseminated in recent months. An Italian report published with the approval of Field Marshal Goering in the *Essener Nationalzeitung* said that the first-line strength of the German Air Force comprised 3,000 machines at the time of the Munich Conference. It seems unlikely, therefore, that German production exceeded 800 planes a month at the end of 1938.

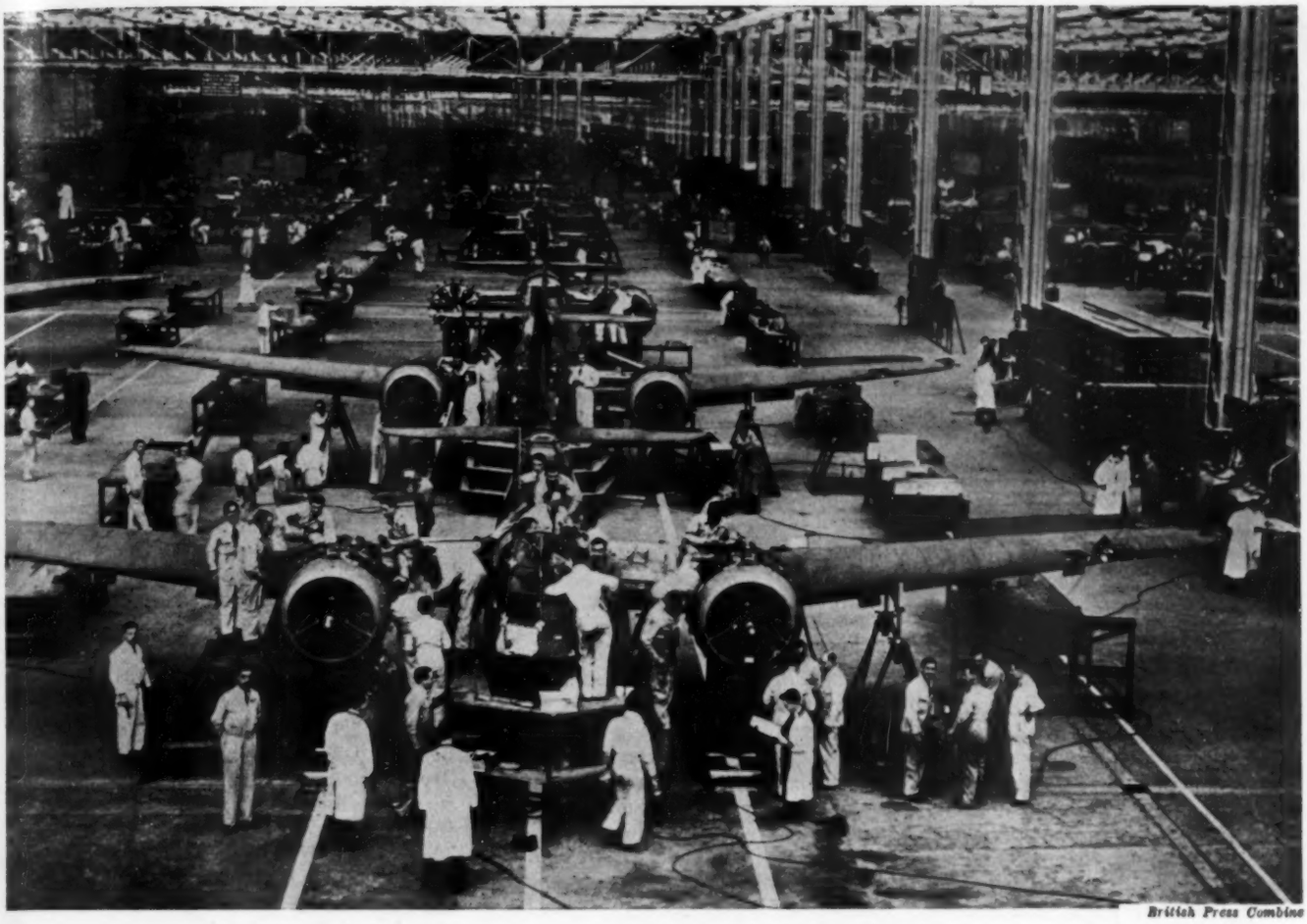
A detailed study made by *The Economist* in April, 1939, revealed that German airplane assemblies toward the end of 1938 were only 500 units a month and that they might be 600 by April.

Aircraft Output Accelerated

Favorable to England is the fact that British plane output is increasing much more rapidly than the German, despite a shorter work-week and less intensive use of plant facilities. If war should break out, it is believed that British production could be increased quickly to double that of Germany.

Germany has an advantage in air dromes, possessing about 900 compared with around 400 in England. If the strategic position of the two countries is taken into account, however, the German advantage is not great.

Figures on British output of military planes make no allowance for future production in Canada or other parts of the Empire. Following the recent visit of the Air Mission under Sir Hardman Lever to Australia and New Zealand, steps have been taken to organize manufacture of military aircraft in Australia on an ultimate basis of 800 units a year. The Bristol Beaufort, a medium bomber with a speed exceeding the 297 m.p.h. of its predecessor the Blenheim, is likely to



Bristol Blenheim bombers are being assembled at the gigantic Rootes Airframe factory, Speke, Liverpool

be built there. The Mission also recommended production of planes in New Zealand. Australia and New Zealand would supply a considerable part of the requirements of the British air squadrons in the Far East.

Confidence in the progress made by England in aircraft manufacture is shown by authorities in their agreement to furnish sizable numbers of Rolls-Royce Merlin engines to the French Air Force pending their production under license by the French Ford Company. In April, moreover, some Spitfire fighters, the latest type to be made, were sold to Portugal. Cooperation between the British and French air forces has now reached an advanced stage. It is thought that production of the Spitfire and of Bristol sleeve-valve engines, as well as of the Merlin, will shortly be started in France.

Britain's plane production in the fiscal year ending March 31, 1940, will be about 800 units a month. This is in sharp contrast with the 100-a-month pace back in 1935. Last March Sir Kingsley Wood remarked, "In November I said that the output of aircraft in May would show an increase of 150 per cent over May of last year. We have achieved that increase already. It was also said that by May of next year the output would show a 400 per cent increase over May, 1938. I am hopeful that this fourfold increase will be achieved by the end of the present year." This would give an output of 500 planes a month in March, 1939, and of 1,000 planes a month by the end of the year.

Four Methods Used

England has used four methods of expanding its aircraft production:

1. Extension of existing aircraft plants, with a government guarantee to meet standing charges if the demand should be insufficient to keep the factories fully occupied after the rearmament program has been completed and if the company has not been able to write off the capital cost of the extensions.

2. Erection of shadow factories at government expense to be managed on the government's behalf by firms in the aircraft and automobile industries.

3. Organization of a subcontracting scheme on a large scale by the Vickers combine whereby 3,500 companies whose plants were not fully occupied on the normal products are employed in the manufacture of aircraft parts.

4. A group scheme (the latest development) comprising groups of four or five aircraft firms. Each group is regarded as a separate unit for both development and production purposes.

Enlarged aircraft production up to the end of 1938 can be traced to more efficient operation of the then existing factories and to the added capacity provided by factory extensions and by the original shadow plants (all of which were working at full blast by January 1, 1939). Further increases in output this year will come from large extensions to existing aircraft factories, from new government factories and from operation of the subcontracting scheme.

New factories or important extensions are now under way for Airspeed, Armstrong Whitworth, Blackburn

Aircraft, Bristol Aeroplane, Fairey Aviation, Gloster Aircraft, A. V. Roe, Rolls-Royce, Short Brothers, Short & Harland, Vickers-Armstrong and Westland. On July 1, 1939, thirty-one shadow factories had been built or were under construction. The Air Ministry was responsible for sixteen of these plants. Eleven of the sixteen were running at full capacity and a twelfth was nearing capacity.

A Twentyfold Expansion

The magnitude of the extensions is indicated by the experience of the Gloster Company. In 1934 it employed 400 men. At the start of 1939 the number had grown to 6,400. The total will reach 8,000 when the latest extension is completed. Similarly, employment by the Bristol Company rose from 1,700 to 20,000 in the last seven years.

Three new shadow factories, it is rumored, will be set up at Coventry under management of Standard Motor Company, Daimler Company and Rootes Securities, Ltd. All three of these firms now operate shadow plants.

Big expansion of the subcontracting scheme was announced in October, 1938. It was stated that Vickers-Armstrong would erect a large assembly plant at Broughton, Cheshire, to be fed with parts produced by companies in the Vickers group and by other engineering firms. The following month a similar plan was launched by Associated Electrical Industries (Metropolitan - Vickers branch which is not affiliated with Vickers, Ltd., the armament company). The shipbuilding firm of John Brown & Company also entered the aircraft field in association with Westland Aircraft, and the English Electric Company in connection with Handley Page.

Finally the group system was announced in March, 1939, with the double aim of reducing the number of designs in service and of facilitating economical mass production. The procedure is for three or four companies to form a group. Then orders are placed with this group for one type of aircraft. Work is distributed among the group.

This plan lessens the amounts of technical work through all stages of design, development and inspection. It has the important effect of reducing the dislocation in wartime if one of the manufacturing units were unable to continue in production.

Much credit for rapid growth of aircraft production must go to the Supply Committee created early in 1938. This body comprises the Under-Secretary for Air, the Air Member for Research and Development, the Air Member for Supply and Organization, a Treasury representative and the recently appointed full-time Chairman of the Society of British Aircraft Constructors.

The committee was authorized to accelerate aircraft output to the maximum. Its first step was to examine with each manufacturer the amount of work he could undertake to produce in a given time. After these estimates were checked, large orders were placed to keep the majority of the companies busy for about two years. In this way the periodic interruption of manufacture arising from the placing of orders in small batches was overcome. In addition, the committee concerned itself with planning further productive capacity, with the supply of labor and of materials, with providing jigs and tools. As a result the feeling between industry and the Air Ministry has changed to one of close cooperation in the past 18 months.

It is difficult to state accurately what has happened to the labor force, partly because there is no way of estimating the numbers employed on subcontract work. Employment is estimated to have increased to 80,000 in the first two years of expansion. At the beginning of 1939 it was believed to have been 150,000 men. Shortly the aircraft working force should reach the 200,000 mark. For the sake of comparison, total employment in the aircraft, motor vehicle, motorcycle and cycle industries in July, 1938, was 357,944.

Little Truculence in Training

Last February Sir Kingsley Wood commented on the continued shortage of skilled men and stated that men were being trained as rapidly as possible at various manufacturers' plants as well as at the Ministry of Labour training centers. The expansion in the labor force, bearing in mind the strong objections of skilled workmen to the creation of a surplus in their ranks to meet normal demands, has been achieved with remarkably little labor unrest, especially in the past 12 months.

In February, 1939, 800 engineers struck briefly at the shadow factory of H. M. Hobson (Aircraft and Motor) Components Ltd. over alleged employment of non-union labor. This was followed by a week's strike of 500-600 men at the Blackburn Works against employment of two newly-trained men on skilled work. In March an eighteen-day strike occurred at the sheet metal works of Hellivell's Ltd. at Dudley and Walsall because of the management's refusal to recognize the shop steward appointed by the men. Six hundred men went on strike the next month for a fortnight at the new Rolls-Royce works at Crewe as a protest against use of girls on capstan lathes. Not one of these strikes was recognized by the Amalgamated Engineering Union, and not one spread to other factories in the industry.

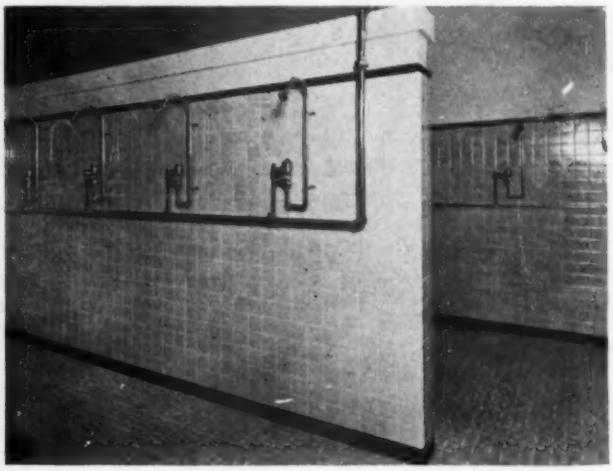
Another short-lived strike broke out June 18 at the shadow factory of Rootes Securities, Ltd., at Speke, involving 5,000 men. It began because an engine fitter who is a shop steward of the union refused to do glazing work on airplanes and was discharged. It was settled on the understanding that the man was to be reemployed and that a court of inquiry would be convened as soon as the men returned to work.

Air Speeds Soar

Though details of new types of English airplanes are kept secret much longer than formerly, mass production has in no way held back developments of new designs. Performance figures are available only for planes now in full production. The Hawker Hurricane fighter has a maximum speed of 340 m.p.h. and the Supermarine Spitfire 362 m.p.h. The fastest German fighters in service are reported to possess a top speed of 320 m.p.h. It is said that the new Heinkel fighter will travel 440 m.p.h. There have been developed in England, however, the Boulton, Paul Defiant and Gloster planes, which are considerably in advance of the Spitfire in speed.

Comparison between bombers is not easy, since figures for bomb load and range are not published in England. The German trend is toward construction of light twin-engined bombers of high speed but low carrying power and range. Principal emphasis in England is on long range. The Germans do not have a bomber as fast as the Bristol Blenheim (297 m.p.h.) which is now superseded by the Beaufort with a higher speed and greater carrying power.

Some authorities estimate the output of training planes at nearly one-third the total production. Excluding training planes, formerly about two-thirds of the planes produced were bombers and only one-third fighters. Today the production of fighters matches that of bombers. The change was made at the time of the Munich crisis and is indicative of a more hopeful view of the value of fighters as a defense weapon.



Comfort Comes to a R.R. Shop

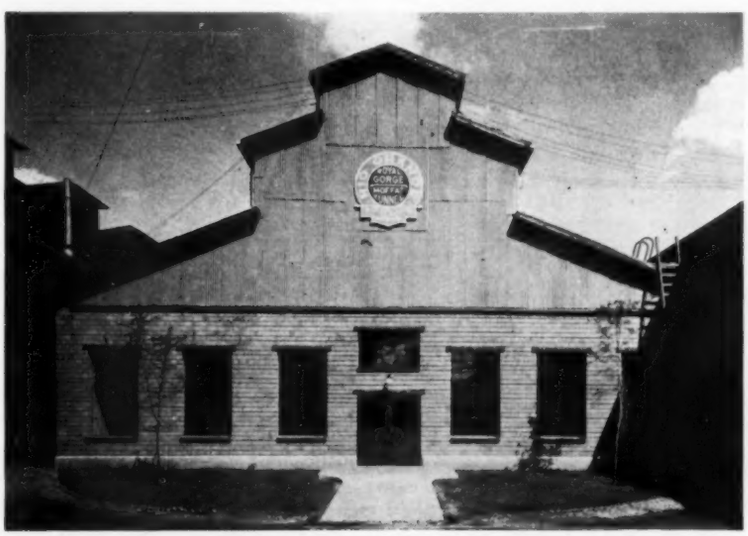
By EARL W. HARMER

THE DENVER & RIO GRANDE Western Railroad shops in Salt Lake City recently expended $14,000 on new and modern equipment for their shop employees' building. As the first step toward renovation, the substantial brick walls of the old 60 x 80-ft. structure were thoroughly cleaned outside and newly plastered inside. A full cement floor and new steel frame windows and doors were installed; plenty of fresh paint was spread about.

The front half of the room is equipped with twelve lunch tables, each 15 ft. long. Benches and chairs are placed around each of the tables with wide aisles left between. Sanitary metal receptacles for waste paper are conveniently located, and the tops of the tables are kept fresh with clean, white roll paper covers. Any man can feel comfortable eating in this room, no matter how spotless his wife's kitchen is kept. Near the center of the tables, and on the main aisle, is a shiny new water cooler with four drinking outlets. Also handy are candy bar and soda water vending machines.

The east end of the floor space is equipped with thirteen rows of steel lockers, 700 in all, where employees can leave personal belongings with perfect confidence. In the center space are the nine giant Bradley Granitol wash basins, large enough to accommodate a total of 120 men at one time.

There are two giant heating units, one at each end of the building. By this means, heat control is easily maintained on the coldest winter days.



(Top Left) Before renovating the locker and washer rooms at the D.& R.G.W. shops looked like this. Lockers, washing facilities and heating equipment were out-of-date. The general atmosphere of dinginess was not conducive to the workers' comfort. All old fixtures and equipment were ripped out to make way for modern sanitary accommodations

(Top Right) No private club has better shower-room facilities than those now enjoyed by the shop men. The 16 x 18-ft. tiled room has twenty adjustable shower heads which are regulated by automatic control valves

(Left) Fifty Holophane units light the modernized building; they are placed between locker rows and elsewhere to give ample illumination

Conveyors in a Job Shop

By K. W. MINK
Erie Works, General Electric Company

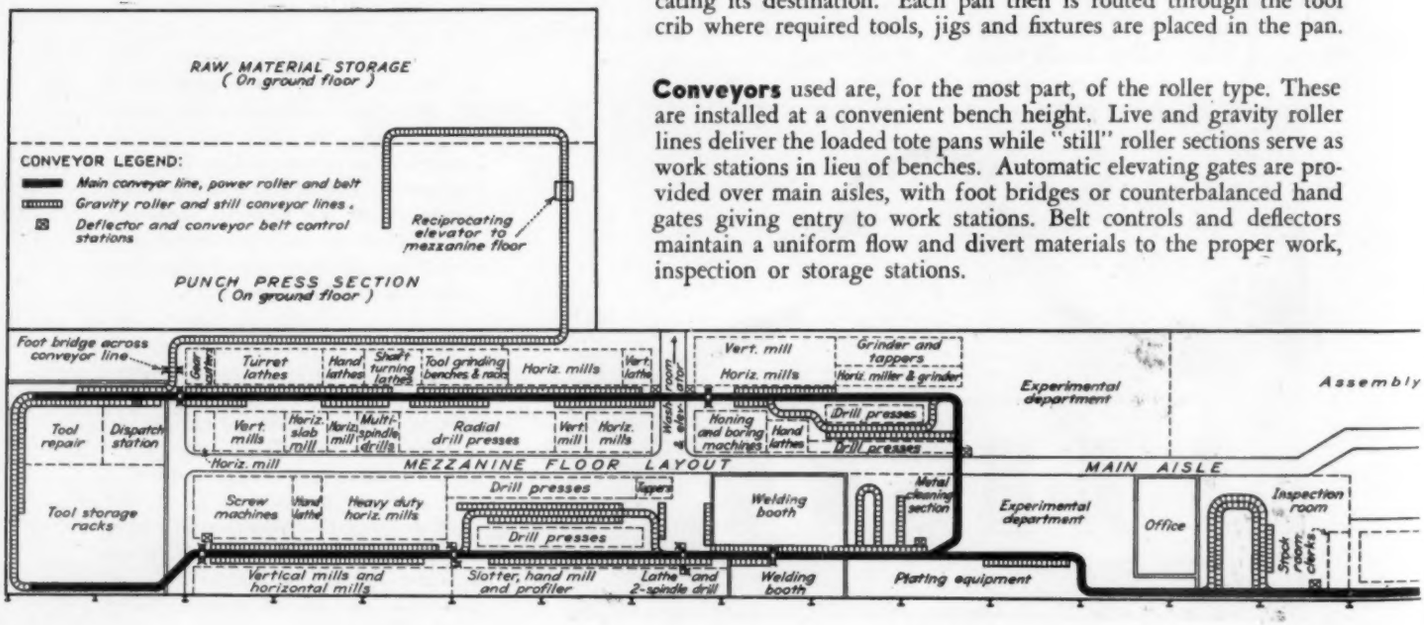
CONTINUOUS FLOW principles can, with modification, be employed economically in the job shop. However, this cannot be done without introducing the necessary material handling equipment. The rapid handling of parts and tools between operations, and final delivery of the parts to inspection and final assembly benches is essential if the advantages of "continuous flow" are to be realized.

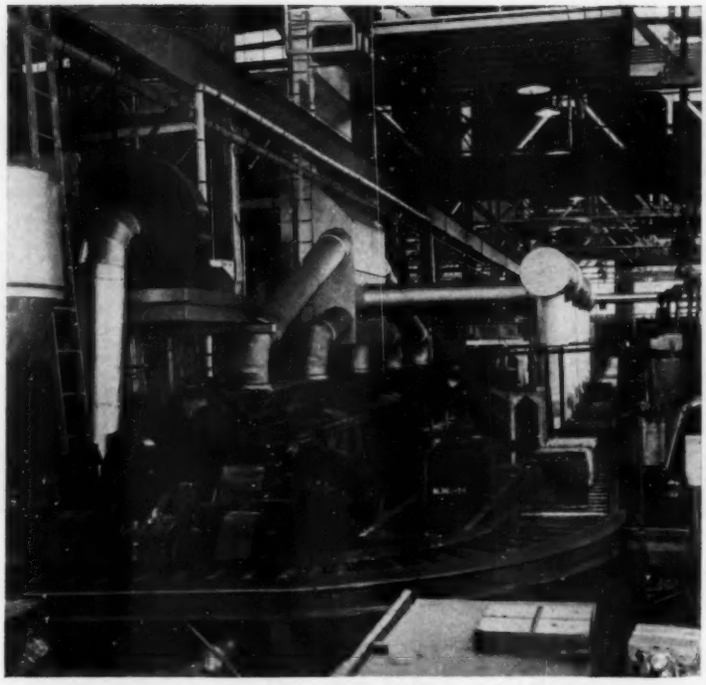
An example of the application of these principles to job-lot manufacture of both simple and complex assemblies is to be found in the Railway Control Division at General Electric's Erie Works. Here approximately 2,000 different types of units, some having as many as 1,000 different forms, are manufactured largely on an "as required" non-repetitive basis. The average load is about 2,400 orders per week, with the normal quantity per order ranging from one to ten pieces.

Incoming raw material is received and stored on the ground floor. From here it is delivered to the punch press section or placed in standard tote pans for transfer on a reciprocating elevator to the mezzanine floor. A gravity feed roller conveyor line passes the material into the central dispatch station. Here the necessary work papers are added, tools are specified and the work is routed, by means of numbered cards, to the various work stations in the department. Each job is returned to the control station at the completion of each operation. By means of a control board, the dispatcher can regulate the load at each station according to its capacity, or locate any order quickly.

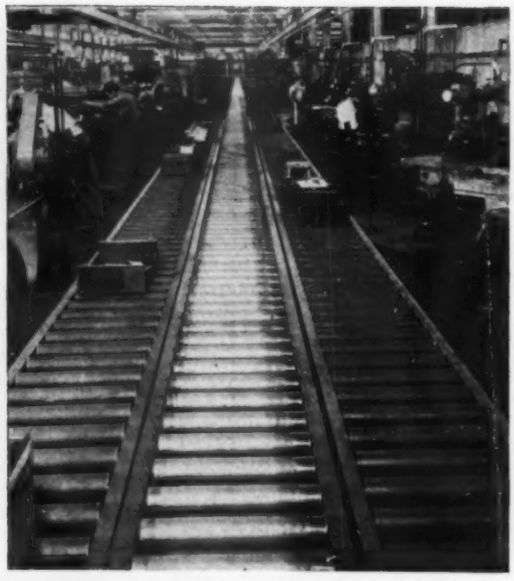
Central dispatch is essential for the successful movement of parts and materials to and from operations. Briefly, materials, blueprints and tools are brought together with the necessary work orders at this point and dispatched as a unit to the manufacturing groups. Each work station is identified by a number; when an order is released the dispatcher attaches to the pan a numbered card indicating its destination. Each pan then is routed through the tool crib where required tools, jigs and fixtures are placed in the pan.

Conveyors used are, for the most part, of the roller type. These are installed at a convenient bench height. Live and gravity roller lines deliver the loaded tote pans while "still" roller sections serve as work stations in lieu of benches. Automatic elevating gates are provided over main aisles, with foot bridges or counterbalanced hand gates giving entry to work stations. Belt controls and deflectors maintain a uniform flow and divert materials to the proper work, inspection or storage stations.





Main line conveyor serves this plating section as well as machining, welding and cleaning groups. It also delivers finished parts to the inspection room and storage racks. Little movement of material by hand is required.



Serving as benches, "still" sections of roller conveyor lines parallel the main line conveyor at each work station. Lost orders are eliminated by keeping tote pans up on these sections.

ADVANTAGES

1. Small lots are processed with minimum expenditures for transportation.

2. Central dispatching of both materials and tools eliminates time normally lost by machine operators.

3. Convenient height of work-station conveyors lessens fatigue in moving materials.

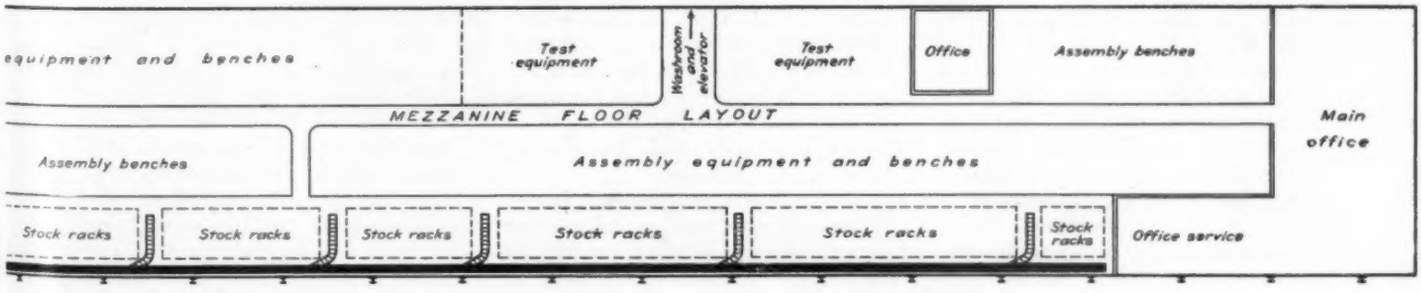
4. Good housekeeping is possible when materials and tools are kept off the floor.

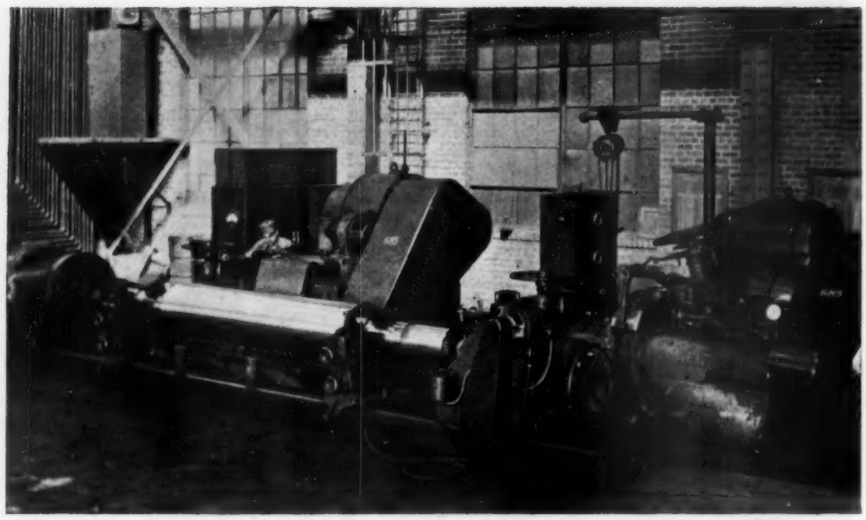
5. Reduction of aisle area provides better utilization of floor space.

6. Manufacturing cycle has been reduced; delays have been eliminated.

7. Orders have little or no opportunity to become sidetracked or lost.

Final inspection operations are performed in and around a loop of gravity roller conveyor sections fed by the main conveyor line. Extra sections of conveyor line in this loop provide necessary storage space for pans of parts awaiting inspection. All finished component parts must pass through this inspection group before delivery to stockroom, assembly section or supply warehouse. A deflector on the main conveyor line shunts all tote pans over onto the inspection loop. A work bench in the center of the loop provides space for gages.





Users of rolled metal want a smooth product free from imperfections. The secret of obtaining it does not lie in the quality of the grinder, the roll or the grinding wheel, but rather in the skill of the machine operator

Luster-Ground Mill Rolls

Here is a grinding technique which has produced rolls with a highly polished finish

By ROBERT J. SPENCE

THE MARKET for plate and sheet metal calls for a product which must have an extremely fine finish. The surfaces of the rolls used must therefore be highly polished for should they contain the slightest imperfection it would be reproduced upon the surface of the product. This places a decided responsibility upon the roll manufacturer, the grinding machine builder, the grinding wheel manufacturer and the grinding machine operator. The latter should head the list because upon his skill rests the success or failure of the other three factors.

The machines upon which rolls are ground vary to such an extent as to make confusing any detailed description of them. This statement is based largely upon the fact that a majority of rolls is being handled on plain cylindrical grinding machines of swings from 6 to 36 in. with and without adaptations made for roll grinding and obtainable in lengths sufficient to take the longest roll a mill expects to grind. The machines are operated either mechanically or hydraulically; either type is satisfactory and the selection is a matter of personal choice, but it is an assured fact that the controls on the hydraulic machine certainly give an infinite number of traverse variations, within the machine's range of speeds, which aid an operator in the rapid and precise production of work. Whatever the size or style of machine it must have certain qualities if good work is to be produced; there must be no vibration between the wheel head and the work and there must be smooth action in the traverse mechanism of the roll-grinding machine.

Standard Grinding Methods

Rolls may be ground concave or convex or they may be slightly crowned in the center. One method is to shape a wheel of wide face to the contour of surface required, and to feed the wheel into the work with a draw-in cut. The other method is to produce the outline by means of a special attachment which guides the wheel-slide forward or back in the reciprocal travel of the wheel past the face being ground. In the first method the width of outline is limited by the width of wheel obtainable and the driving power of the machine.

Usually, rolls wear concave in the center of the face width and must be removed to the grinding machine to be dressed. Because of the wear in the center, the greater share of the grinding takes place on the outer ends of the face. When the rough grinding operation just "cleans out" the center portion, the roll is then ready for the finish grinding. The matter of just cleaning out the wear-marks is important because all rolls are expensive.

Two methods of grinding rolls are in use. One is to hold them on headstock and footstock centers as employed in ordinary cylindrical grinding, and the other is to support them on their own journals in specially designed journal rests. All small rolls are ground by the first method, while extremely large rolls are ground by the second method. But this description of the different methods is confusing because rolls as large as 30 in. in diameter and 10 ft. long are being ground on work centers.

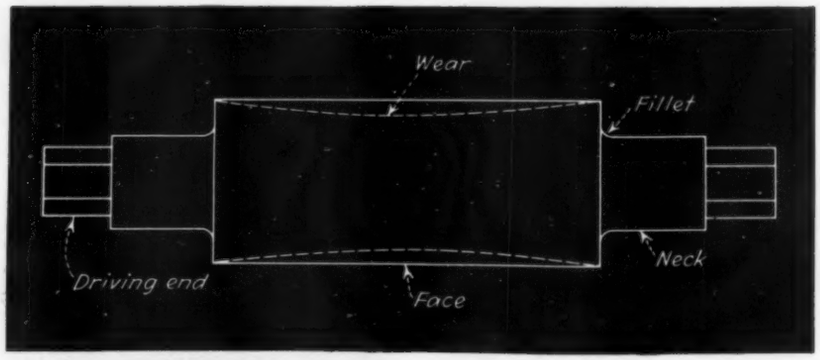
Under working conditions in the rolling mills, all rolls are supported on their own journals. Therefore, in dressing a roll the journals or necks should be ground with care so as to insure straight and round bearings; otherwise, the time and effort spent upon the body would be wasted since the body and journals must be concentric with each other. Also, the fil-

lets in the corner of the necks should be ground carefully, because they must conform to the mating fillets in the rolling mill bearings where they take the end-thrust of the roll.

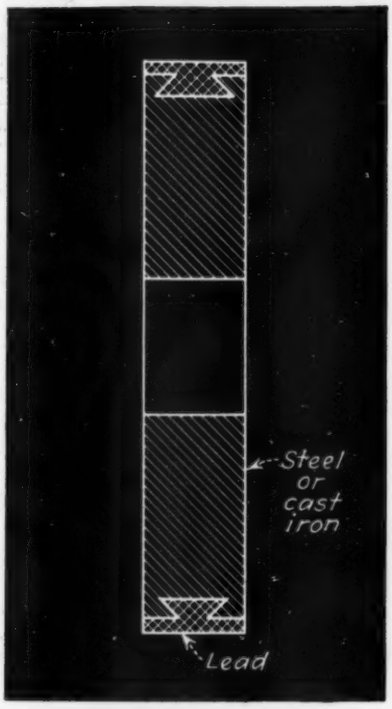
A roll which is ground while rotating on its own journals must, of course, have true journals. These journals are ground directly on the grinding machine while held in their neck-rest, which is especially designed with this added operation in view.

To make a list of wheel selections for the grinding of rolls is an almost impossible task because of the large number of varying and changing factors involved, just as there is in any type of grinding which covers a large field. There must be considered the diameter and length, rigidity of the roll, the kind of material in the roll, the type, size and condition of grinding machine used, the finished surface desired and the method employed by the operator.

These are all generalities, but if I were pinned down to make a single statement of selection from which a beginner could make an intelligent start, I would say that for the rough grinding of chilled-iron rolls he should use a soft vitrified silicon-carbide wheel of No. 36 grain size, and for the finish grinding he should use a soft vitrified silicon-carbide wheel of No. 60 grain size. For the rough grinding of hardened steel rolls he should first try a soft vitrified aluminum-oxide wheel of No. 46 grain size, and finish grind with a soft vitrified aluminum-oxide wheel of No. 60 grain size. But—and this is a big but—I would recommend these grinding wheels only in case the operator were to follow my particular type of grinding, which is described later.



This is the usual type of wear on a roll face, which must be dressed by grinding. The fillets in the necks should be ground carefully because they must conform to the mating fillets in the rolling mill bearings



A steel-bodied lead-coated lap running at a slow speed will produce a lustrous finish when the work is rotated at high speed and castor oil is used to hold the abrasive

The style of grinding used by most grinding machine operators in producing a lustrous finish is that which is known as the "building up" of a surface by the use of a comparatively coarse-grained wheel for the rough grinding and then following with a succeeding number of steps in which a finer grain and a softer grade is used in each different step. For instance, in the rough grinding of a hardened steel roll, the wheel used might be of No. 46 grain medium-vitrified aluminum-oxide. Then, as a first step in finishing, a soft vitrified aluminum-oxide wheel of No. 80 grain size might be used. As a third step, use a soft shellac-bonded silicon-carbide wheel of No. 200 grain size. For final polishing, soft shellac-bonded silicon-carbide wheels of No. 300 or 500 grain size, or both, might be used.

This style of grinding is typical of the operations used and the kind of wheels utilized, but it leaves the operator open to such a varied selection of wheels to suit his personal handling of the "building up" process that it is next to impossible to stipulate a list of wheels that would be acceptable to any group of operators, even having identical conditions.

This method of "building up" a surface finish is costly because of the excessive time required for actual grinding, the time required for the changing of wheels, and the time and diamond cost involved in the truing of wheels. These tie up the grinding machine longer than is necessary.

I used to grind rolls by a similar "building up" method, but could see a waste of time and effort in such grinding. Therefore, I experimented with a different style of grinding and secured extremely good results. Here is the simple method as applied to the grinding of a chilled iron roll on a machine of satisfactory character.

A New Grinding Technique

First rough grind the roll at a slow work speed, a fairly deep radial depth of cut and a traverse of work or wheel not quite the full width of the wheel face using, say, a soft vitrified No. 36 grain silicon-carbide wheel. Then replace this wheel with the same type of wheel but of No. 60 grain abrasive; true it carefully with the diamond. Proceed to finish grind as in ordinary cylindrical grinding work, using the normal work speed and a traverse of about one-half or one-third of the width of wheel face and giving to the work a degree of finish as high as possible in this type of grinding.

Now for the final grinding. Proceed as follows: True the grinding wheel with the diamond nib turned so as to expose to the wheel its sharpest corner. Pass the diamond across the wheel with a truing depth of 0.001 in., then pass it back with a depth of 0.0005 in., then with a depth of 0.00025 in. and then twice more across the wheel face without giving it any additional feed whatever. Be sure that the diamond's traverse across the wheel face is very slow.

Now increase the rotation of work to a fast speed—just about the same surface speed used in finish filing a piece of work on a lathe. Then carefully bring the wheel down to the rotating work. With a depth of cut of about 0.00025 in., give to the work or wheel (according to the type of machine) an extremely slow traverse and but one pass of the wheel across the work, throwing the wheel back away

from the work the instant one-half of the wheel face passes beyond the extreme end of the roll face.

These are the simple directions without any instructional diversions. However, they need amplification. Also, each operator must experiment with actual grinding because of varying conditions.

Eliminate Chatter Marks

In the first place, all grinding machine operators of experience know that a too-high work speed will leave fine chatter-marks in the work, and that such minute chatter-marks on a finished roll are unthinkable blemishes. True, but that is one point where care and skill come into play, for by experimentation with different degrees of high work speed the operator can discover at which speed such chatters begin to appear. He can then keep just below that critical speed. Also, with a high work speed and a too-deep finish cut of the wheel, chatter-marks will appear, even though the cut is as low as 0.0025 in. Therefore, he may have to decrease this cut still further. But the writer knows from experience on several sizes of machines with different types of drive and with different diameters of rolls that there exists in each case a certain combination of work speed and depth of cut that produces a high burnish on the work free from chatter-marks.

Next we must consider traverse speed. This is a simpler matter because the operator will readily learn by a few experimental changes just which traverse speed is optimum for the work conditions. However, the traverse must be slow to produce desired results.

Finally, there is the question of using a single pass of the work past the wheel face. Why not a repeated number of passes until the wheel assumes a glorified glaze and acts as a burnishing agent against the work surface? I do not know the technical answer for that. However, on some rolls with which I have experimented, an additional pass causes a ribbon-like feed-line to appear on the work and that with repeated passes this feed-line is intensified. On other rolls I have been able to pass back and forth across the work repeatedly without causing a single feed-line to show up. It is all a matter of experimentation.

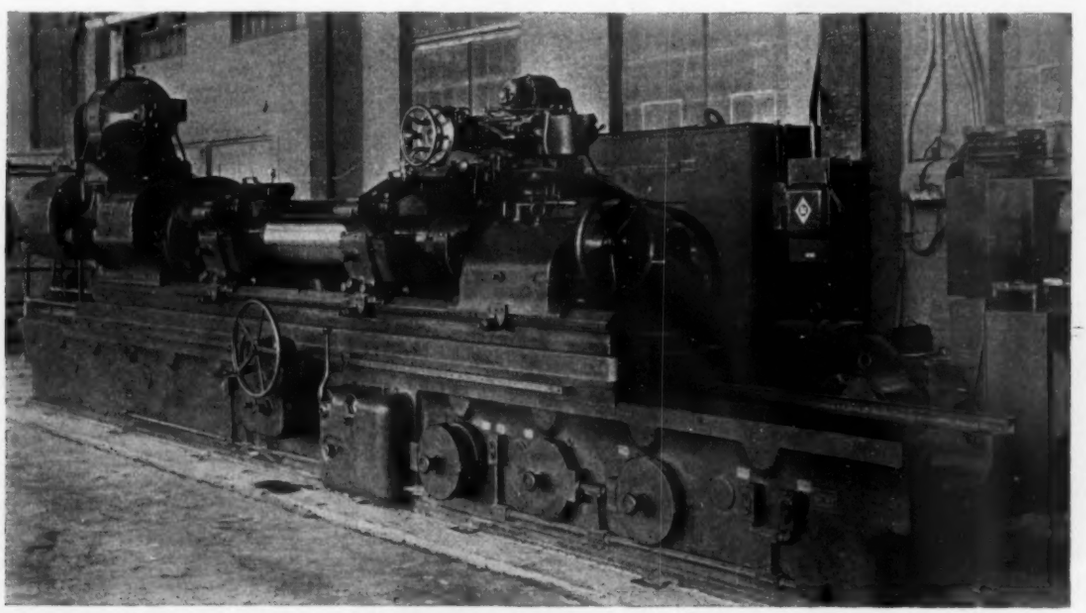
All these instructions appear to make of this type of grinding a complicated method of producing a highly polished finish, but this is not the case in practice; in reality it is all quite simple and needs but a little practice to produce excellent results. After all, the "building up" method requires an equal degree of study and is much more expensive.

Scratches on the work surface are caused by particles of metal or grit getting into the coolant and catching between the wheel and the work. Such scratches can be prevented by using either a filter or by wrapping a few thicknesses of fine cheesecloth around the water nozzle.

Whether or not to lap a roll is a matter of opinion and is optional with each individual mill. That lapping can produce a better finish than grinding is beyond question, but the difference is so slight as not to justify an added operation, provided grinding is done by a skilled man. I recall grinding a chilled-iron roll several years ago, and trying to improve the finish by lapping with a steel-bodied lead-coated lap, using various fine abrasives and viscosities of lard and machine oil. Finally, by using a slow lap speed, a high work speed, and castor oil as a holding medium for the abrasive flour, I succeeded in producing a finish better than that of grinding; in fact, the best surface finish I have ever seen. The solution to the job was to use an oil of a sufficient tackiness to adhere to the work.

Carboloy Rolls

I have recently heard of the grinding and lapping of a new kind of roll —rolls made of solid Carboloy, 3 in. in diameter by 32 in. long. Because of the excessive hardness of this material, the problem of grinding was difficult but was solved by the use of a wheel coated with diamonds on the periphery. The lapping operation was a usual one and the finish attained was extremely lustrous. The reason for the use of this hard material was to secure rolls which would retain their finish and accuracy longer than other rolls in use. The cost of these Steckel mill working rolls was about $5,000 each and the wheel used in grinding cost approximately $400.



The majority of mill rolls are being handled on plain cylindrical grinding machines of swings from 6 to 36 in. with and without adaptations for roll grinding, and obtainable in lengths sufficient to take the longest roll a mill expects to grind

High-Speed Spot Welding

Combining features of the simultaneous multiple spot welding and the successive multiple spot welding methods, "Ultra-speed" welders operate up to 20 welds per second

By H. W. ROTH

DURING the past ten years, various methods have been developed to increase the efficiency of spot welding for high production sheet metal assembly. Most of these methods may be described by the general term "multiple spot welding", and divided into two different groups: (1) simultaneous spot welding, and (2) successive multiple spot welding.

Under the first group we may list projection and parallel spot welding with individual electrodes. Both methods offer the advantage of definite time saving with the disadvantage, however, of considerably increased transformer capacity. This has to be in direct proportion to the number of spots or projections welded simultaneously.

This factor is of decided importance wherever twelve or more welds have to be performed simultaneously, as a single phase load of several hundred kilovolt-amperes involves a considerable problem for the plant engineer and the power company.

Another disadvantage of the "simultaneous" method is the difficulty of uniform current distribution to the individual spot welds. This difficulty increases where the welds are spread over a large area, which results in current connections of different lengths to the various electrodes.

In order to correct this condition various means have been used with more or less success, as for instance individual secondary circuits or individual transformers. The most satisfactory results may be obtained by using two individual transformers with the primary coils in series or parallel and the secondaries in parallel.

Successive multiple spot welding, as the name indicates, performs several spot welds in succession. Various means are used automatically to locate the welds and to maintain a predetermined time interval between welds, as well as proper timing for each weld.

The earliest and simplest machine for successive multiple spot welding applied a number of spot welding electrodes, each equipped with an individual pressure spring and current supply, and an equal number of cams mounted on a common shaft operating the individual electrodes in succession; another cam operated a control switch to supply short intervals of current to the welding transformer as soon as each succeeding electrode came under pressure.

Low Transformer Capacity

The main advantage of this method was the fact that only a small transformer capacity was required regardless of the total number of welds, as only one weld was performed at a time. It is obvious, however, that the total welding time was in direct proportion to the number of welds. Each individual welding cycle consisted of the time required to apply welding pressure, plus time for current application to obtain sufficient welding heat, plus cooling time, plus time to release pressure. Although each part of the cycle required only a fraction of a second, experience has proved that this method will not safely permit more than three to four welds per second, even under the most favorable circumstances.

Newer methods, using the same principle, have introduced hydraulic or pneumatic pressure to replace the cam action of the older type of machine. These machines are equipped with a multitude of small cylinders to operate the individual electrodes in proper rotation. This makes it possible to weld panels or stampings of complicated shape, because the individual cylinders may be mounted in the welding fixture in any location and at any angle. An automatic distributing valve supplies pressure to the various welding heads in succession, with an average speed of two to three welds per second. The welding current automatically is timed in synchronism with the pressure.

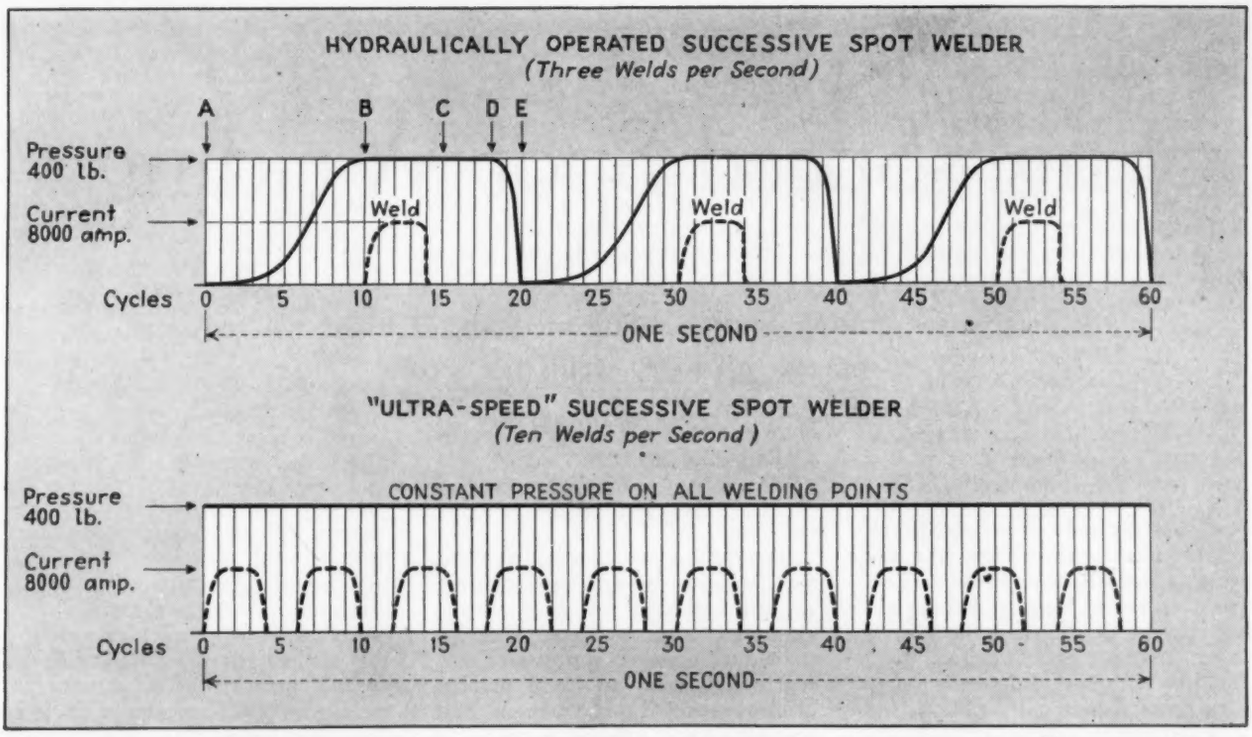
Compared with projection welding, this method requires only low transformer capacity, at a sacrifice of welding speed. Compared with portable gun welding, it offers higher speed and easier operation. Nevertheless, the five years of practical experience since its first introduction have proved that it is not the ideal method for production welding.

Special hold-down clamps are required to keep the panels in shape and to assure perfect contact with the welding dies. Frequently the welding points "freeze" to the sheet metal and consequently will lift the panel off the die, when the point returns.

The welding speed is limited to about two to four welds per second, because higher speeds make it difficult to maintain proper synchronization between welding pressure and current. Improper synchronization results in burnt welds and sticking electrodes.

The upper portion of the accompanying diagram schematically illustrates the time relation between electrode pressure and welding current if the machine is set for a speed of three welds per second. The horizontal line is divided into cycles (60 per second), while the vertical scale indicates welding pressure (solid curve) and welding current (dotted curve).

From the moment when the distributing valve supplies oil pressure to the first welding gun, ten cycles are allowed for the welding electrode to move into position and to build up the required pressure. Then, at point *B*, the welding current is applied for a duration of four cycles (1/15 sec.). At point *C* the welding



The upper portion of this diagram illustrates the time relation between electrode pressure and welding current for an hydraulically-operated successive spot welder set to make three four-cycle welds per second. Welding current successively is on for four cycles and off for sixteen cycles. Relation between pressure and current for a period of one second on an Ultra-Speed successive spot welder is illustrated in the lower portion of this diagram

current is switched off, but pressure has to be maintained for three to four cycles (*C* to *D*) in order to cool the weld. Then, the valve opens the exhaust and allows the welding electrode to return, while at point *E* the next electrode point starts to move.

Cycle Speed is Limited

As long as this cycle repeats itself with sufficient uniformity, good results will be obtained. But as soon as the proper relation is disturbed, trouble will start. For instance, dirt in one welding cylinder may cause sluggish movement of the welding electrode. As a result, the welding current will be on before the electrode reaches the metal and, therefore, the point may freeze to the sheet, or at least burn the weld. If the electrode is returning too slowly, it will draw an arc and pick up metal. The shorter the total welding cycle is the more difficult it is to maintain proper synchronization. This is the main reason why the speed of such welders is limited to two to four welds per second, depending upon the metal thickness to be welded. Inspection of the diagram shows that out of 20 cycles only four are used for the actual welding, while sixteen are wasted for electrode movement and cooling time. The cycle efficiency therefore is only 20 per cent.

While the simultaneous multiple spot welding method offers an ideal cycle efficiency with all the welds made at the same time, it requires high transformer capacity and involves the difficulty of current distribution. Successive spotwelding, on the other hand, shows a poor cycle efficiency, but it requires only small transformer capacity and allows a more uniform distribution.

Controlled by Commutator

Combining features of both methods, "Ultra-Speed" spot welders incorporate a multitude of individual electrodes, insulated from each other, which are put under pressure simultaneously. Each electrode is equipped with an individual spring, air or hydraulic pressure means. Furthermore, each electrode is connected individually by a flexible cable to a current distributing commutator so designed that it rapidly switches the welding current to the various electrodes in sequence. The primary current is interrupted in synchronism with the action of the secondary commutator, which eliminates any arcing on the commutator contacts. It has been possible to design a commutator unit which safely operates at a speed from 8–20 spots per second, depending upon the metal thickness to be welded, and a maximum current of about 40,000 amp. can be controlled.

The lower section of the diagram illustrates the cycle efficiency of ultra-speed spotwelding. The solid horizontal line indicates a constant pressure of, for instance, 400 lb. on all electrode points simultaneously. The dotted curves indicate the duration of flow of current for the individual welds. The on-time again is four cycles as in the upper diagram. But the off-time is only two cycles, which is sufficient to switch the current from one electrode point to the next. This is possible because all the electrodes are permanently under pressure and no time is lost for motion of electrodes. As the diagram indicates, a total of ten welds per second is the result. The cycle-efficiency has been increased from 20 per cent to 66⅔ per cent. It may be further increased by using a shorter off-time.

Electrodes Clamp Metal

The fact that all electrodes are under pressure during the complete welding cycle makes it possible to produce better welds because the electrodes chill the metal surface and prevent annealing of the crystal structure. Furthermore, the electrodes act as an effective clamping device, holding the sheet metal in correct location and shape.

What Tool Steel?

II—The effect of rapid variations in tool sections, and the need for considering the use to which the tool is to be put must be considered in selecting a tool steel

By S. C. SPALDING
Metallurgical Engineer, The American Brass Company

IF THE DESIGNERS of tools would consider the relation of design to heat-treatment, the job of the metallurgist and hardener would be freed of many a headache. Too often tools are designed correctly from a mechanical standpoint but with little or no consideration given to the metallurgical aspect of the problem.

It is recognized that when stress is applied to a body of symmetrical section the applied load tends to distribute itself evenly over the body being stressed. If, however, the body is not symmetrical but contains sharp angles, abrupt changes of sections or keyways, the stresses tend to build up to high values at these localized points. A recent analysis of the effect of a notch on a plain cylindrical piece when subjected to tensional stresses shows by actual figures that the stress in tension is multiplied two or three times its original value at the base of the notch. This is simple static tension, not impact nor any of the other dynamic stresses which a tool experiences in service. The effect of keyways, transverse holes, radius of fillets, and types of finish on endurance limit is given in accompanying tables.

The effects of threads are illustrated by the findings of Stanton and Barstow, who showed that screw threads on a specimen subjected to repeated stress reduced the endurance limit to 67 per cent of what it should be, reckoned on the area at the bottom of the thread. All of the figures shown in the accompanying tables are on medium carbon alloy steels and would be much accentuated in the case of hardened tool steels.

Of necessity, many tools must contain some or all of these deleterious features. By using generous fillets, large radii, and properly proportioned chamfers, we can mitigate their effect and so design our tools as to eliminate these weak points. We must not let ourselves be deluded by the thought that because a tool in use is not subject to shocks and impact stresses that we can avoid these precautions.

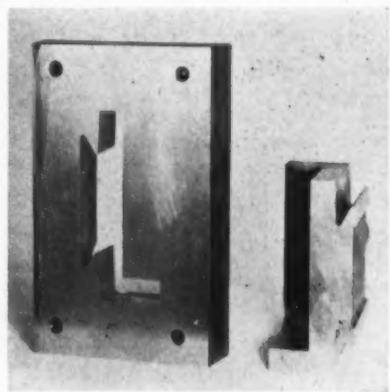


Fig. 1—A high-carbon high-chrome steel should be selected if a blanking die of irregular contour is needed for a large number fo pieces. Oil hardening tool steel would be less expensive and can be used if service requirements are not severe

EFFECT OF KEYWAYS

Type of Ends	Per Cent of Endurance Limit
Sled Runner Ends	62
Rounded Ends	48

Taken from data by Petersen.

EFFECT OF TRANSVERSE HOLES

Size of Hole Inch	Size of Specimen Inches	Per cent of Endurance Limit
0	Any	100
¼	1	71
3/16	3	53

Taken from data by Petersen.

EFFECT OF RADIUS OF FILLETS

Radius of Fillet Inch	Per cent of Endurance Limit
15.75	100
0.59	85
0.24	63
0.12	48
0.04	33
0	25

Data by Lehn & Mailander.

EFFECT OF FINISH

Type of Finish	Per cent of Endurance Limit
Polished	100
Ground	92
Smooth Turned	83
Rough Turned	80
Depth of Notch:	
0.004 in.	75
0.020 in.	59
0.080 in.	58

Taken from Tests by Faulhaber.

The effect of varying keyways, transverse holes, fillet size and different finishes on normal endurance limit of a given part are indicated in the above tabulation. The above figures are from tests made on medium carbon alloy steels and are accentuated in the case of hardened tool steels

Most tools must be hardened and in the hardening operation itself, they are subjected to greater stress and shock in many cases than they may ever be in use. It is a safe statement that more broken tools and parts are caused by the neglect of the designer or mechanic in omitting proper fillets or radii at sharp corners than by any other single cause.

Another important point is to avoid attaching small sections to large ones, unless it can be done by gradual tapers. If we visualize the hardening of a piece, we can see why heavy stresses are set up in this operation. These are localized at the point of attach-

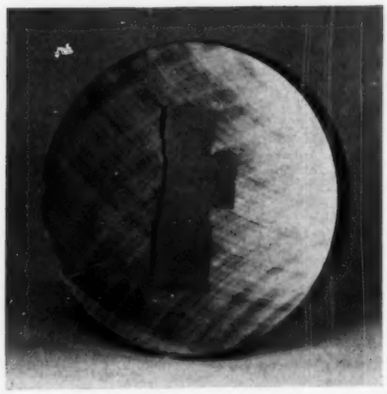


Fig. 2—A trimming die of symmetrical section normally would be made of carbon tool steel unless the material being trimmed is highly abrasive

ment of the small section and if the change of section is abrupt, it will probably break off. If the designer will visualize the hardening operation when he is designing a tool, failures in hardening will decrease. A few examples will show how these principles can be applied in the selection of the steel and the heat-treatment of tools.

Fig. 1 shows a typical blanking die and punch. In the first place, the shape of the die is rather irregular. From the standpoint of wear and cutting ability, we might select the plain carbon water hardening steel. When we consider, however, the need for minimizing distortion and the risk of cracking in hardening, we realize that the carbon steel will not be satisfactory. We must have a steel which will harden in oil or air. Steel selection then narrows down to the oil hardening tool steel or the high-carbon, high-chrome type. The decision between these two steels must be on the basis of service required. If the maximum number of pieces and regrindings of the die are desired, the high-carbon high-chrome steel would be selected. If only a limited production were required, the oil hardening tool steel would be used, as it is less expensive and easier to work and harden. For the punch we would, for the same reasons, discard the water hardening carbon tool steel and, as wear and cutting properties are not so essential on the punch as the die, select the oil hardening tool room steel, or possibly even steel No. 5 of group No. 3 in the table previously given (*AM*—Vol 83, page 515).

A trimming die of symmetrical shape is shown in Fig. 2. The normal selection of a steel for this die would be the carbon tool steel, one of the steels of group No. 1 in the table. The exception in this case might be the selection of a high-carbon high-chrome steel if the material being trimmed were very abrasive. On forming rolls, where there is a thin continuous ring attached to a heavy body, with a sharp angle at the point of attachment and the thin ring is the working part of the tool which must be hard, we cannot use a carbon tool steel and heat-treat it successfully. We must use an oil- or air-hardening steel. Where the work

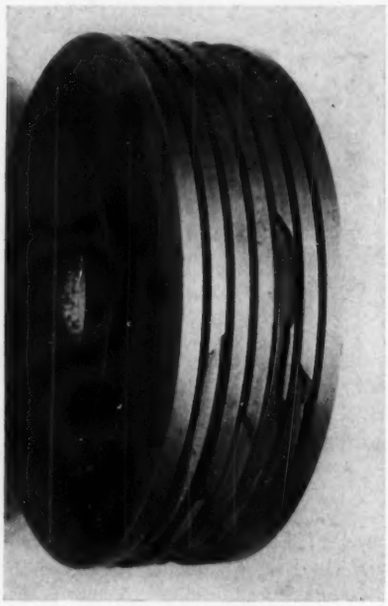


Fig. 3—Thin sections attached to heavy bodies ordinarily cannot be hardened successfully when the tool is made from carbon tool steel

Fig. 4—Where the combination of a hard face and tough shank are required, as in this forming hob, carbon tool steels differentially hardened are frequently selected

does not call for extreme hardness, the selection would be one of the chisel and punch steels.

What happens when a carbon tool steel is selected for a part like the roll mentioned above is shown in Fig. 3. Here the thin sections have been broken away in heat-treating the roll. Fig. 4 shows a hub used to force an impression into a soft die block. Here we need hardness to maintain shape and to make a sharp image in the block. Since the hub is driven into the block by a falling hammer, the shank or back portion of the tool must be tough so as to resist battering without chipping. These properties can be realized best by a carbon tool steel differentially hardened.

Open Question to Tool Makers

By N. V. SMITH
President, Smith-Johnson Corporation

Why doesn't some tool manufacturing concern come out with little flat blocks, one side of which would be serrated with 60-deg. sarrations, and with an accurate dimension from the pitch line of these serrations to the back so that they might be used in pairs between a standard micrometer to measure the pitch diameter of cut threads without the usual fussing around trying to hold three wires, a micrometer and the piece?

If the distance from the pitch line to the back were made $\frac{1}{4}$ in., then it would only be necessary to subtract $\frac{1}{2}$ in. from the micrometer reading to get the accurate pitch diameter of any thread; the helix angle of the piece would have no effect.

V-thread micrometers are a makeshift at best as they do not fit all threads accurately.

Another much needed tool around the die-making shop are small thread mills made something like a Woodruff key cutter but with a V-edged cutter for use in the milling of threads in die casting dies. These need only be made in the standard forms of thread and possibly in various diameters and reaches. Most shops make their own at considerable expense. Then, too, if one breaks it means a long tedious wait until another tool is made up.

Sectional Dies

By the use of die sections and inserts, the designer often simplifies the problems met in making and repairing press tools

By C. W. HINMAN
Tool Engineer
Kobzy Tool & Electric Mfg. Company

BUILT-UP cutting members have several advantages over the one-piece type: (1) easy making, (2) contours are easily changed, (3) new sections can be substituted for spoiled portions, (4) punch or die sections with nicked or sheared edges are easily replaced, (5) notching sections are easily installed, and (6) sections can be made and hardened that are impossible or impractical in a one-piece cutting member.

Die sections are likely to spread apart when blanking, forming or drawing heavy materials; therefore, all die sections must be positively and rigidly "backed" to avoid spreading. In built-up drawing dies, for example, the sections are sunk deep within the die shoe, usually the entire depth of the sections, and are forced tightly together by inserting tapered keys or wedges, as in Fig. 153.

Standard shapes for punch and die sections have been commercially developed. By arranging the outlines of these sections in combinations, many different contours for cutting a large variety of blanks can be quickly produced. The usual cutting outlines of these sections are straight, square or round cornered, and arc segments. A cross-section view of a die using these sections is drawn in Fig. 154. At the left, a plan view shows the method of arranging the sections; the dashed line represents a portion of the die outline, or the finishing line. A large flange on each section provides means for rigidly securing the upper and lower sections on the punch holder and die shoe by using screws and dowel pins.

When commercial die sections are not used, the sections are made of tool steel and without flanges. This avoids the unnecessary expense of machining flanges onto the blocks.

The blocks are of suitable widths and lengths to provide a generous area of base for inserting heavy screws and dowel pins. The sectional lengths must not be too long in relation to their width and depth, in order to avoid excessive grinding of warped blocks after hardening. The length also depends largely upon the contour shapes of the blocks.

The average size of a straight section is finished to approximately $1\frac{5}{8}$ x $2\frac{7}{8}$ x 12 in., but segments of arcs, corners and rounds are made less

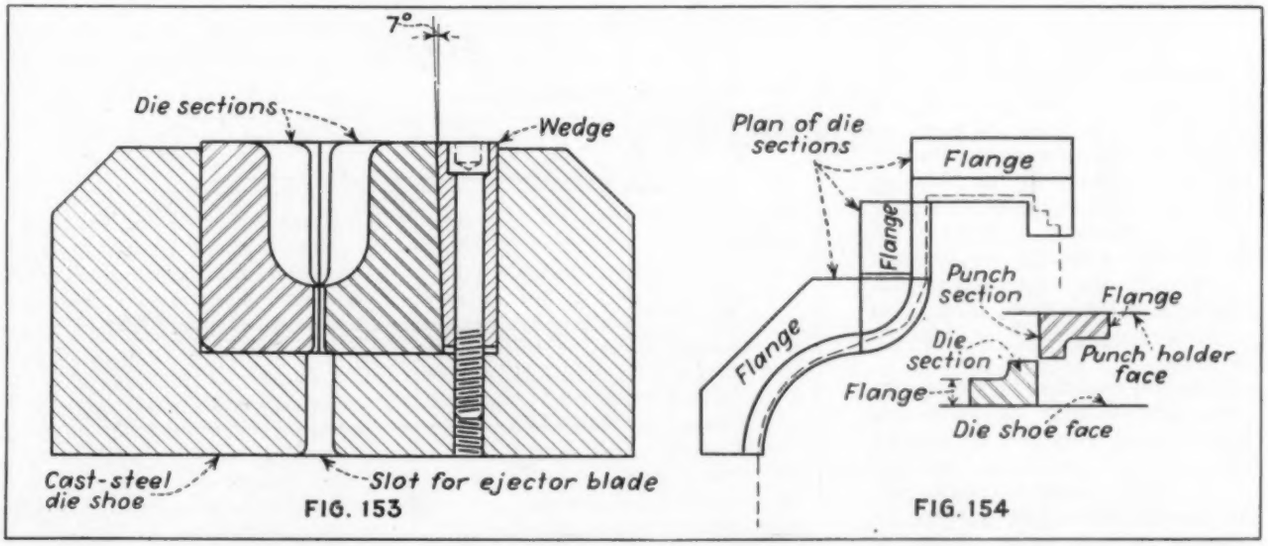


Fig. 153—A long narrow die used for drawing heavy steel shells is made in sections forced tightly together with a wedge. Fig. 154—Standard commercial shapes for punch and die sections are used for large trimming and blanking dies

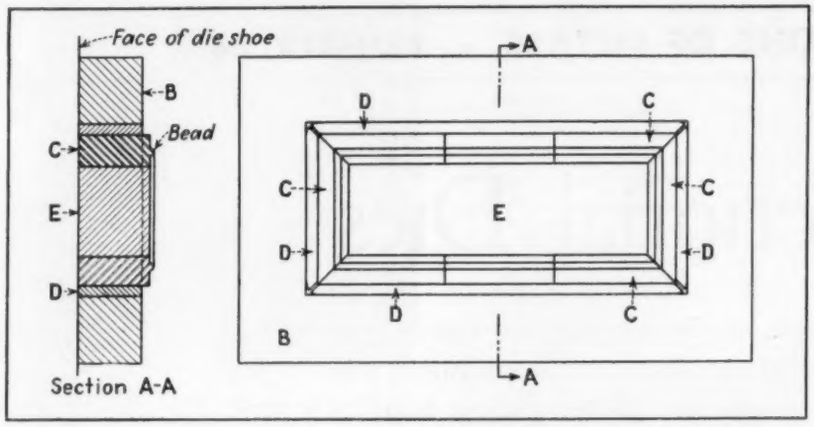


Fig. 155—Precision members of sectional dies should be arranged so that the toolmaker can get out of difficulties if special fitting of parts should be needed

than 12 in. long, and of a more substantial area.

The large die frame *B*, Fig. 155, is made of structural steel. The opening in the frame is flame cut, and is then machine finished. Eight hardened bead-embossing sections *C* within the frame are press fitted end to end, with miter-joints at the four corners. Surrounding the beading sections are four lengths of cold-rolled steel filler sections *D*. Sections *D* back-up the beading sections, and can be ground to fit closely around them. If the interior of the die frame is over or under size, the toolmaker can easily compensate for these variations in the final assembly by altering the thicknesses of the filler sections.

The punch sections, which carry the mating female sections, not shown, are arranged and held as described for those in the die. Screws and dowel pins are inserted into all the different parts from the shoe below, or the punch-holder above.

A machinery-steel center core *E*, which may or may not be necessary, is fitted within the eight section. The whole design is now practically the same as if made from one piece.

The sectional die represented by Fig. 156 is designed for blanking large lamination segments for a rotor having a completed diameter of 76 in. Twelve segments are required to complete the circumference for each layer of laminations, there being an insulating gap of $\frac{1}{16}$ in. between the ends.

Four tool-steel-clad die sections are used. The sections are immovably locked in all directions by notched and anchored shoulders, and are placed within a deep receptacle sunk in the die shoe. Die sections are retained by one wedge section at the front and another at the right. Socket-head capscrews enter each section at essential points, with their heads in counterbored holes under the die shoe. Two die inserts are also shown at *A*. The punch, not shown, is also built of steel-clad sections which are "banked" securely around a solid center core.

A spring-pad within the die is actuated through vertical pins *B*. The lower ends of the pins rest on a cushion plate, which is the upper part of a pneumatically operated unit secured in the press bed. Work pieces are prepared by shearing them into a convenient trapezoidal shape.

The segments are limited by a tolerance of 0.002 in. for the width, length and radius of the piece. Sizes of the punch and die are determined by using precision-made templets.

Die inserts are ordinarily of two distinct varieties. One type is shown in Fig. 157 at *A*, while the other more common type appears in the same figure at *B*. Both types are press fitted into the die block, but if the insert be large enough it can be held by screws from beneath the shoe.

The purpose of the insert at *A* is for enlarging a small die opening to facilitate working out and filing the interior contour through a deep block. The die block carries a portion of the die outline, and the insert edge carries the remainder. The small size of this die opening is indicated by the given dimensions.

The purpose of the insert at *B* is to provide a small projection that extends into a comparatively large die opening; the extended end of the insert being shaped to become a part of the larger die contour itself. Die inserts can easily be replaced if—

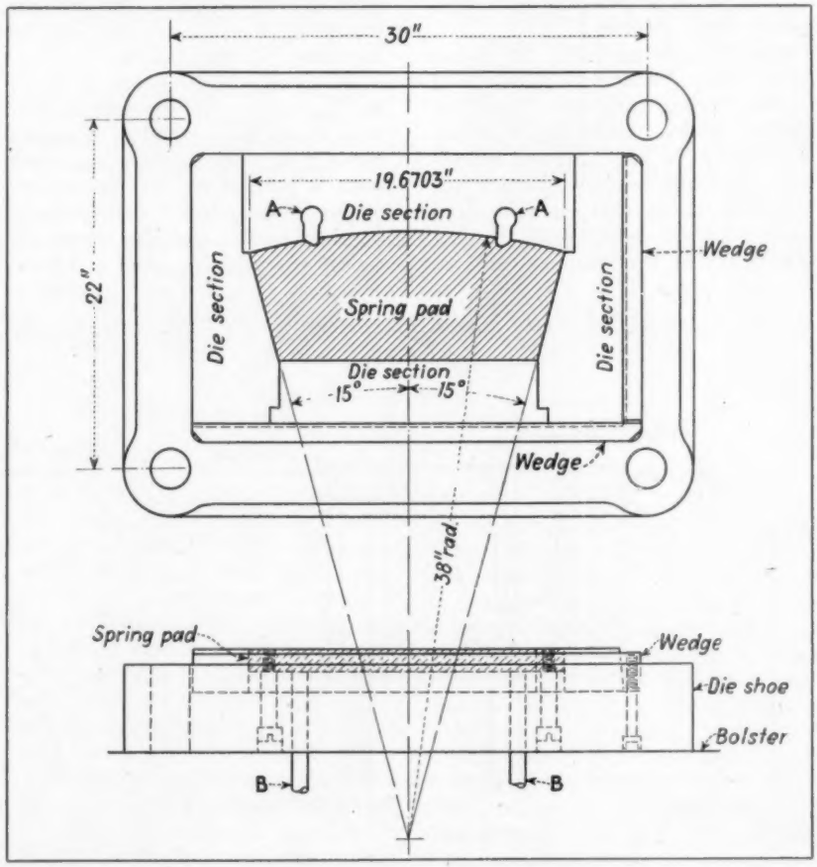


Fig. 156—Wedges at the front and right retain the precision-made die sections in the recessed die shoe

after press operations—they develop wear or become nicked or broken. Die inserts are retained in parts of round holes; the centers of the holes are accurately located by using a system of "stepped-dimensions" for a jig-boring machine.

Four straight sections can be inserted vertically from the bottom side of a die block and then securely locked with a key, as shown in Fig. 158. At *A*, one of the sections is shown separately. The sections are milled from one piece of sufficient length to cut off four equal pieces. The pieces are then hardened and ground. The idea here is to provide the three small close-together rectangular openings shown on the surface of the die block.

In the cross-sectioned view, the four straight sections *S* are shown inserted from the bottom side of the block into a previously prepared rectangular hole. The sections lie at an angle of ¼ deg.; the angle, of course, provides the die clearance for the rectangular holes. The last insert *K*, is a wedge key and is press-fitted tight, thus locking together the entire group of inserted sections. The flat sides of the block, together with the projecting ends of the sections, are then surface ground flush. The ¼ deg. angles are greatly exaggerated to present this principle clearly.

A "split-bushing", Fig. 159, can be separated in halves for grinding an elongated die opening, or other internal shape. This method is often used in precision die work when great interior accuracy of small die openings is necessary. After grinding, the bushing is press-fitted in its proper location in the die block.

Part 25 of Mr. Hinman's series will appear in an early number.

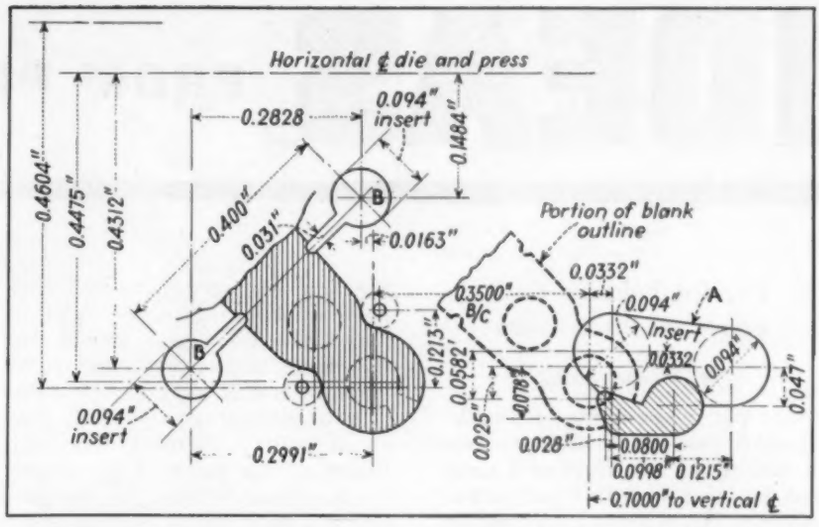


Fig. 157—In this small portion of a seven-station die for producing a double row of blanks, two types of inserts are used: a large one as at A to give access to a small die opening, and a small weak projection, as at B, which is cheaper to make and replace than if made solid in the die contour

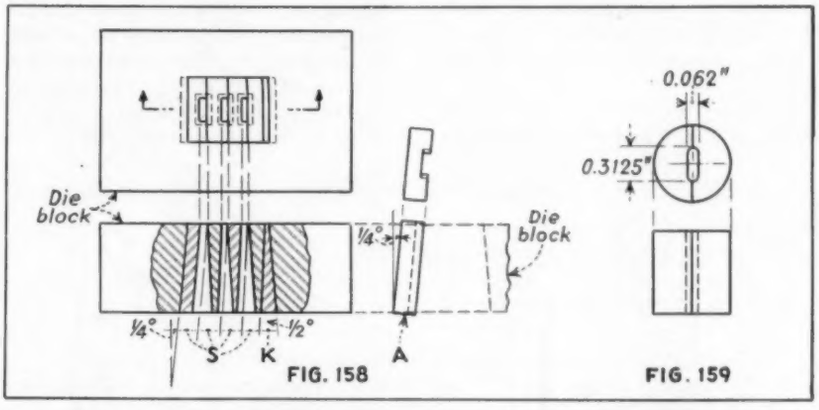


Fig. 158—Small close-together openings in a die block can be obtained by inserting small sections through the die block and locking them with a wedge. Fig. 159—Greater accuracy in small die openings may be obtained by grinding the form into the halves of a split bushing and then press-fitting the bushing into the die block

Is There a Demand for Simple Machines?

By CHESTER FRANKLIN

Most of us who visit machine shops of various kinds, frequently hear a demand for more simple machine tools. One of the best mechanics we know, who is best satisfied when he is tackling jobs that stump the average shop, is among those who want simpler machines. As he expresses it, "all the accuracy but fewer gadgets." The machine builders are likely to claim that this is simply a demand for a lower priced machine of the present types. Others want to know just what users mean by simple, which is a fair question.

Aside from the machines which perform new operations, or old operations in new ways, the difference between modern machine tools and those of earlier vintage is increased accuracy and stability, and greater conveniences for operating it. As we want to maintain accuracy, the only chance for simplification seems to be in the conveniences.

In the case of a milling machine for example, we might omit the duplicate controls that enable the operator to handle the machine from any side. This is a convenience and saves a few seconds as well as a bit of shoe leather for the operator. Production shops doubtless find that it pays to save these few seconds.

Those who ask for simpler machines might do well to prepare specifications of the features to be omitted to secure machines simplified to their liking. Where the changes simply involved omissions of parts, they might save some money for the buyer. If, however, simplification means redesigning to omit such units as quick-change gear boxes, the cost of such changes would not be justified without an assured demand for a considerable number of simplified machines.

IDEAS FROM PRACTICAL MEN

Die for Folding Two Edges of Flat Blanks

By H. B. WILSON

The die shown in Fig. 1 was designed to perform the first operation in folding the two edges of a right- and left-hand sheet steel part such as shown in Fig. 4. Fig. 1 is an elevation of the die, which consists of punch *B* and die parts *C, F, D* and *E*. Spring plungers *E* are for ejecting the formed part from the die and for holding the blank, when placed in the die, in line with the die-steel parts *F*. Gages *D* locate the blank in the die. Parts *D, F,* and *C* are also shown in Fig. 3, which is a view of the die at section *A-A*.

In order to machine the punch shown in Fig. 2 and part *C* shown in Fig. 1, it was necessary to figure the angle α. Referring to Fig. 2, plane *JAB* is constructed on center line *AK* and bisects angles *DAC* and *FBE*. Lines *AC* and *BE* are extended to the point of intersection *I*, which is then joined with *J*, forming two right angles at that point. Right angles are designated by arcs. In triangles *JAB* and *JBI* it can be seen that angle *AJB* is similar to that of the center line of the bottom face of the punch and the upper face of the die, and is 35 deg. Angle *JBI* is one half of angle ω shown in Figs. 3 and 4, and is 35 deg. 45 min., or 35.75 deg. Triangles *JAB* and *JBI* have line *JB* in common which will be considered as unity. With *JB* as unity, line *JA* in triangle *JAB* is the cosine of 35 deg. and in triangle *IJB* is the tangent of 35.75 deg. In triangle *JAI*

$$\text{Tan } \alpha = \frac{IJ}{JA} = \frac{\tan 35.75 \text{ deg.}}{\cos 35 \text{ deg.}}$$

$$= \tan 35.75 \text{ deg.} \times \sec 35 \text{ deg.}$$

$$= 0.7199 \times 1.2208 = 0.87892$$

or angle $\alpha = 41$ deg. 19 min.

It was desirable, before making the die, to know the value of angle θ. This angle, shown at sections *B-B* and *C-C*, is the angle at which the die will bend the edges. Referring again to Fig. 2, plane *AGH* is constructed perpendicular to planes *ACEB* and *EBF* making angle *HAB* 35 deg. In triangles *AHB* and *GHB*, line *HB* is common to both and will be considered as unity. With *HB* as unity, line *GH* in triangle *BHG* is the sine of 35 deg. 45 min., and line *AH* in triangle *AHB* is the cotangent of 35 deg. In triangle *AGH*

$$\text{Tan } \theta = \frac{AH}{GH} = \frac{\text{cotan } 35 \text{ deg.}}{\text{sine } 35.75 \text{ deg.}}$$

$$= \text{cotan } 35 \text{ deg.} \times \text{cosec } 35.75 \text{ deg.}$$

$$= 1.4281 \times 1.7116 = 2.443$$

or angle $\theta = 67$ deg. 45 min.

Fig. 3 shows both the right- and left-hand parts with the edges bent as shown in section *B-B*. Parts *B* and *C* were made of semi-steel castings. Parts *F* were made of hardened tool steel and were attached to part *C* by screws.

The die for finish forming was of very simple design, having a flat punch and die.

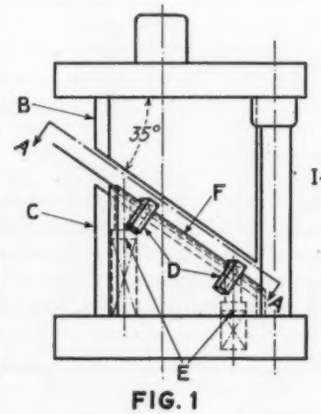


FIG. 1

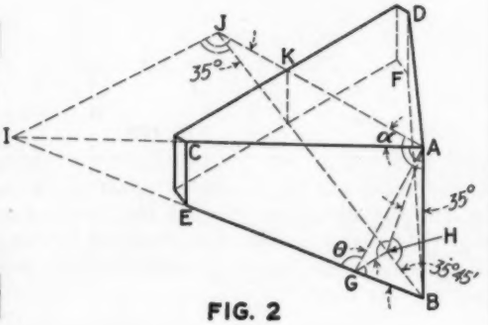


FIG. 2

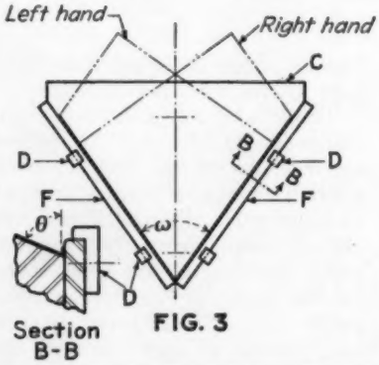


FIG. 3

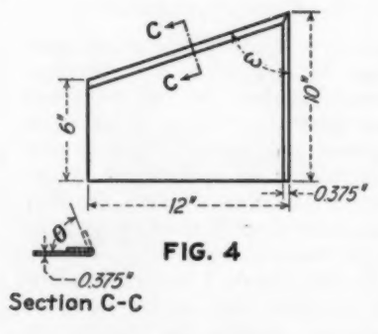


FIG. 4

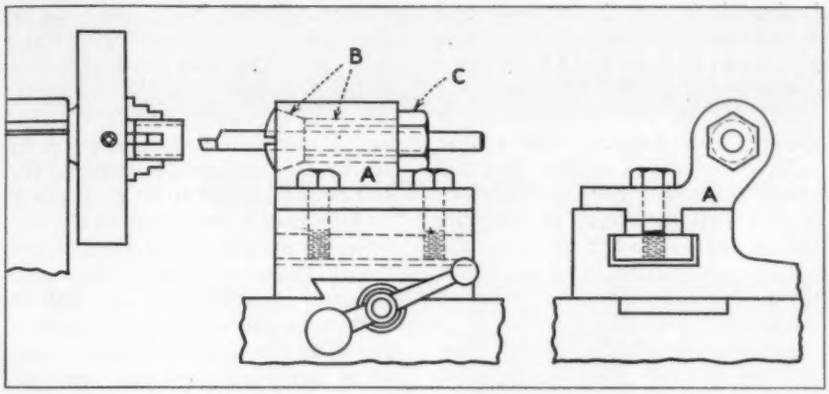
In order to machine the punch and die for folding the two edges of the flat blank shown in Fig. 4, angles α and θ had to be determined. The author's solution of the problem is given in the text

Holder for Boring Tools

By FAY E. CLARKE

In the illustration is shown a boring tool holder for the lathe. It consists of the holder proper *A;* the spring collet *B*; the nut *C*; and two bolts and nuts for attaching it to the toolblock in place of the regular toolpost. The nut *C* is for tightening the collet on the boring tool. The holder is bored at the center height of the lathe and the hole is tapered at one end to suit the taper on the collet.

The boring tools are made of round stock in fairly long lengths so they can be adjusted for boring holes of various depths. The boring tools can



Spring and chatter is minimized by adjusting the tool so that the overhang is little more than the depth of the hole being bored

be made from as many different diameters of stock as there are sizes of collets available. Very satisfactory boring tools can be made by building up the points by arc welding Tool Weld or some similar hard material on them.

One of the features of this holder is the rigidity with which it holds the tool, since the tool can be adjusted so that its overhang will be little more than the depth of the hole to be bored. The result is that spring of the tool and chatter are reduced.

Keeping Drawings Clean

By JOHN E. HYLER
R. G. Le Tourneau, Inc.

Since good blueprints can be made from drawings made with a soft, black pencil, many concerns are not having their drawings inked in, the result being that smudging is a greater problem than ever. Pencil drawings can not be cleaned thoroughly without partly erasing some of the lines, so it will be wise for the draftsman to work first on the part of the drawing at the top of the board in order to avoid as much as possible working over lines that have been drawn.

It is often possible to prevent smudging a pencil drawing by covering the part that has been finished with tracing paper so that the lines and points may be seen through it. Where soft pencils are used it is a real problem to keep the table top relatively free of graphite unless one has some art gum at hand with which to go over it periodically. In using a soft pencil, a little graphite will be released as each line is drawn, and which will not adhere to the paper. Use a draftsman's brush and form a habit of brushing away excess graphite after each few lines have been drawn.

Erasers have a bad habit of collecting graphite. An eraser that works well today may make smudges tomorrow. Some draftsmen have advocated rubbing an eraser on sandpaper to free it of graphite. Undoubtedly there are many who have never tried the simple expedient of washing it with plain soap and water. Next time you go to wash the graphite from your hands, take your erasers along and wash them. You will be surprised to find how fresh they will emerge from an ordinary soap and water bath and the good job they will do afterward.

Chuck Accessory

By J. HOMEWOOD

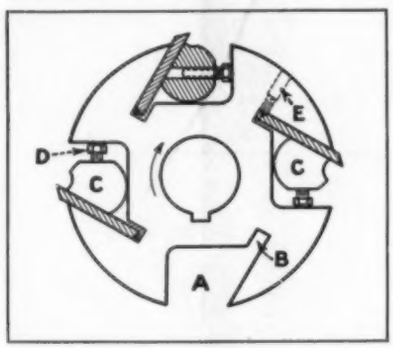
A three-legged spider such as shown at *A* is a convenient accessory to the three-jaw lathe chuck. Such a spider is useful as a backing for work that is centered on one end only and on which the chuck jaws have a short hold. It prevents the work from slipping endwise toward the headstock under the pressure of a coarse feed and eliminates the necessity for tightening the chuck jaws on it excessively.

The spider is held in place by the lug *B* which is turned to fit the hole in the chuck body. The legs can be made narrow to permit a minimum closing of the chuck jaws.

Inserted Tooth Cutter

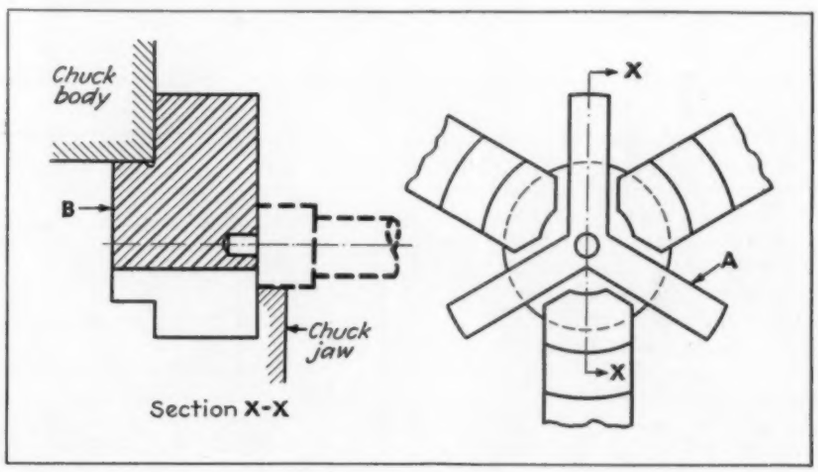
By CARL VON MOLKTE

Needing some milling cutters and not being able to buy standard equipment, I made several as illustrated. The cast-iron blank was drilled and reamed, then turned and faced on a mandrel between centers. The slots *A* and *B* were milled, using a dividing head. They could be cut on a shaper by laying out or by using indexing centers.



This milling cutter was made from a cast-iron blank; the keys C *hold the cutters in place after adjusting the latter by cone-pointed screws* E

Keys *C* are made from cold-rolled bar stock, flattened to the angles of



Where the chuck jaws have a short hold on the work, the spider prevents it from slipping endwise in the jaws under pressure of a coarse feed

the slot, and grooved to provide chip room. These keys are held by fine thread cap screws *D*, which should have a tight fitting thread. Cutters are adjusted by cone pointed screws at *E*. Lock nuts can be used on the cap screws and lock screws behind *E* but as yet I have not found them to be necessary.

High-speed steel stock can be used for the cutters with as many locking screws as the width of the cutter requires. The rake angle can of course be varied to suit the work to be done.

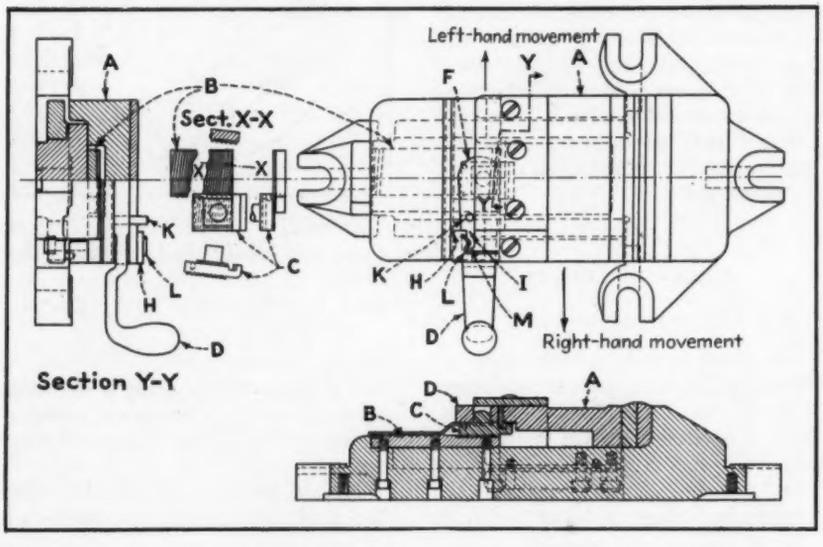
Quick-Acting Machine Vise

By B. SPECTOR

The purpose of the vise illustrated is not only to clamp the work efficiently, but to provide means for disengaging the clamping mechanism from the movable jaw quickly and at will so that it can be operated freely for reception and removal of work of widely varying thicknesses. Clamping is effected by a lever-operated cam that moves the jaw through a sliding member in decreasing increments and its effective contour is such that when rotated through one-quarter of a turn at a time, the movable jaw is caused to move 0.0025, 0.0005, 0.00025 and 0.0001 in., respectively.

Essentially, the device consists of a special machine vise in which the sliding member *A* is attached to the movable jaw; the stationary rack *B* having teeth cut diagonally; the sliding rack *C* also having diagonal teeth meshing with the stationary rack and to the back of which the operating lever *D* is pivoted; the cam *F* at the inner end of the operating lever of which it is an integral part: the plate *H* having a slot at *I*; the pin *K* in the operating lever; and the flat spring *L* bent as shown. The diagonal teeth in the racks are employed so that when the movable jaw has been pushed into contact with the work, pushing the sliding rack to the left across the stationary rack as far as it will go causes the movable jaw to tighten gently on the work.

In operation, with the work in place and the operating lever in the position shown in the plan, moving the lever bodily to the right causes pin *K* to enter the slot *I* and slide therein until it passes the apex of spring *L* and comes to rest in the bottom of the slot in position *M*, at which time both racks are out of mesh and the movable jaw is free to slide in either direction. When the operating lever is pushed bodily forward, carrying the sliding rack with it, the cam bears on the sliding member and causes the movable jaw to come gently into contact with the work. When the operating lever is pushed to the left, resistance is offered to passage of pin *K* by spring *L*. Continued pushing to the left causes spring *L* to let go of pin *K* and the lever to jump or fly to the left, bringing the pin out of the slot and the racks into engagement. Due to the diagonal inclination of the teeth in both racks, the sidewise movement of the sliding rack causes it to move forward, carrying the operating lever and its cam with it and causes the movable jaw to pinch the work gently against the stationary jaw. When the operating lever is rotated clockwise, the cam bearing on the sliding member causes the movable jaw to clamp the work tightly.



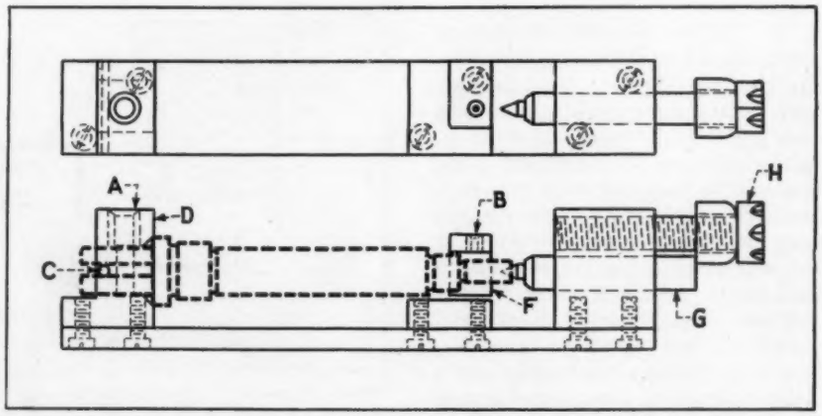
This clamping mechanism can be disengaged at will, permitting the movable jaw to be quickly adjusted for work of widely varying thicknesses

From Junk to Jig

By CHARLES WESLOW

The drill jig shown is an example of what can be made from scrap parts. The work to be drilled required two cross holes in bushings *A* and *B*. A $\frac{1}{8}$-in. slot in the left end of the piece engages pin *C* in the jig and prevents the part from turning during drilling. In loading the jig, the slotted end of the shaft is slipped into the countersunk hole in block *D* and over the pin. The other end is laid on the pad *F*, the sliding center *G* is advanced to engage the center hole, and the screw *H* is tightened against a loose bushing and the center.

Practically all of this jig was made from scrap. The three cast-iron blocks were picked up, likewise the center and the screw. The center was already turned smaller on one end, and all I had to do was cut off the end to suit the travel of the screw.

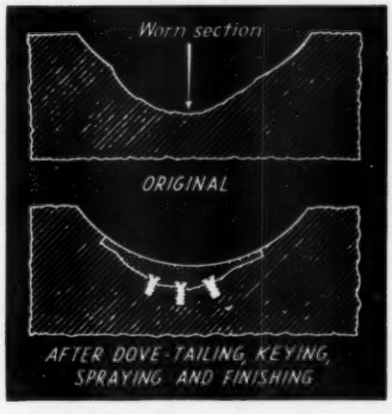


Scrap picked out of the junk pile found its way into a drill jig that served the purpose as well as if designed by a tool designer

Surface Preparation for Metal Spray—II

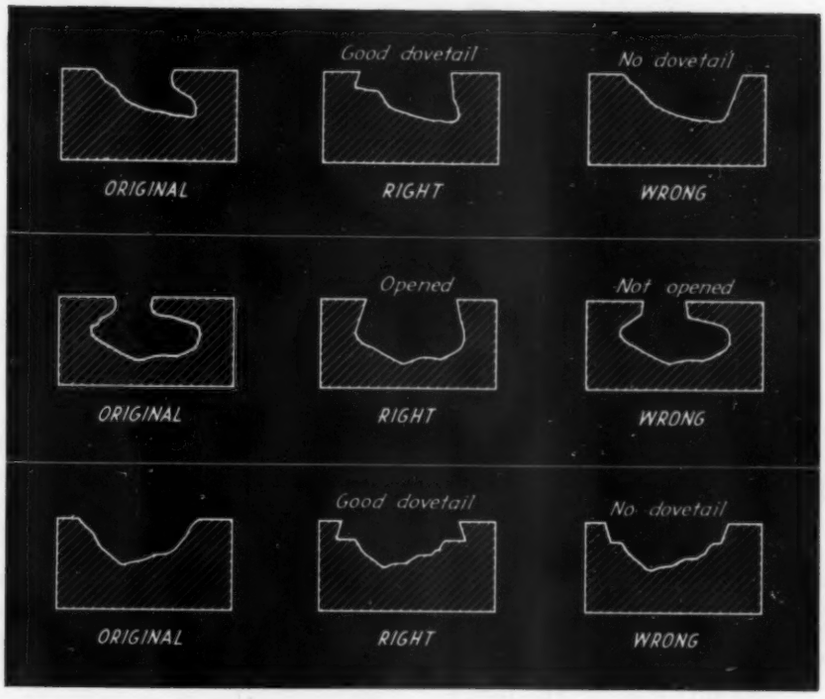
WHENEVER POSSIBLE, sprayed metal coatings should be dovetailed to eliminate exposed edges of the sprayed metal, as described previously (*AM*—Vol. 83, pages 533 and 534).

When a dovetail cannot be formed in the base material, as when spraying a flat surface, the best method of bonding sprayed metal is to slot the edges of the flat surface with a hacksaw. The blade should be at least $\frac{1}{16}$ in. thick. The width of the slot should always be greater than the depth to eliminate any chance of the sprayed metal bridging instead of filling the slot. The slot should be $\frac{1}{2}$ in. long on the side to be coated and not over $\frac{1}{16}$ in. long on the side which is uncoated. Where a maximum bond is required, or where a heavy coat is being applied, the slots should be spaced about $\frac{1}{4}$ in. apart. For lighter coats, a spacing of $\frac{1}{2}$ in. or even 1 in. will be satisfactory, depending upon the bond strength required. This method is used in conjunction with grit or sand blasting and the slots should always be cut before the blasting operation.

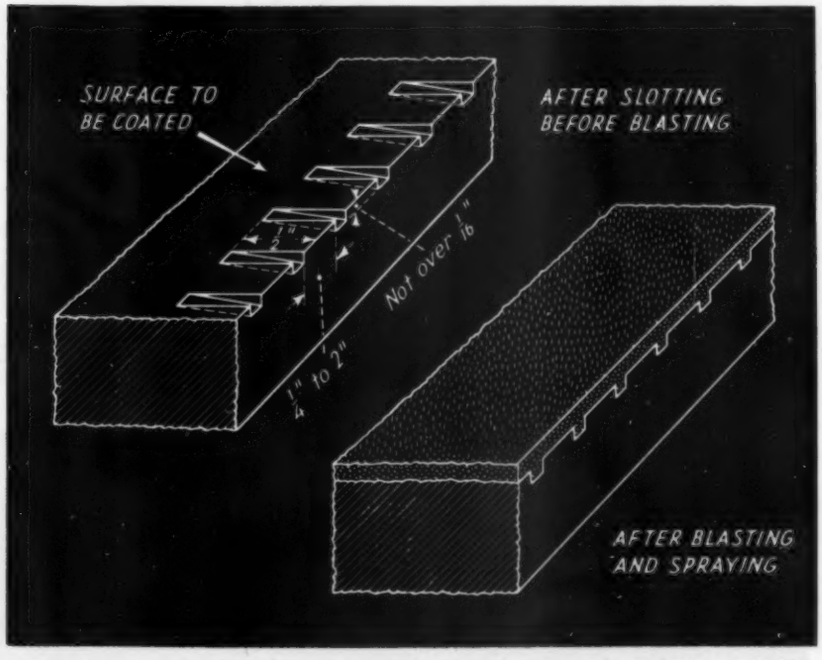


The use of flat-head screws or similar anchorages sometimes is advisable where a heavy coating is to be applied on a concave surface, such as a cavitated surface on the interior of housings

Where a surface can neither be dovetailed nor slotted as explained previously, additional anchorage may be required. In such cases, flat-head screws or a similar anchorage can be



It is important in preparing blow holes or defects for metal spraying to chisel out and undercut the edges of such defects. Care should be used to open the hole large enough so that the sprayed metal can be applied without bridging over



Flat surfaces can be slotted as shown to form anchorages for sprayed metal. The distances between the slots vary from $\frac{1}{4}$ in. to 2 in., depending upon the thickness and required strength of the sprayed coating

Surface Preparation for Metal Spray—II

placed in the base metal so that the sprayed metal will anchor around them. Such screws should always be blasted thoroughly after they have been inserted and before spraying. The screws should be of substantially the same metal as the metal being used for coating.

Blow Holes, Defects and Cracks

Blow holes and defects to be metal sprayed should be dovetailed or keyed preparatory to applying the sprayed metal; this is usually done by undercutting the edges of the defect with a chisel. The defect should then be grit blasted before spraying. The hole should always be opened large enough so that the sprayed metal can be applied without bridging over.

Cracks should be opened up with a chisel and dovetailed as much as possible, as shown in one of the illustrations. Sometimes, it is advisable to drill a small hole at each end of the crack to keep it from progressing after spraying. This is necessary only in about 10 per cent of the cases and can be determined by the nature of the crack and the piece being repaired. Before spraying, the surface of the open crack should be grit sprayed.

Oil or Grease

Oil or grease on the base metal will destroy the bond between the base metal and the sprayed metal. These spots can usually be detected after the blasting operation because of their slightly darkened color, but sometimes they will not be noticed until the spraying operation when the heat of spraying will bring the oil to the surface and will discolor the sprayed metal slightly. In such cases the oil should be removed by burning it out with a torch, or where possible, by degreasing the pieces in a standard degreasing machine. The method described previously for preparing the surface for spraying should then be followed.

Non-metallic Surfaces

Most materials, such as cement, plaster, brick, paper, cloth, etc., are sufficiently rough for spraying, and if clean and dry they require no further preparation. However, they may be roughened by sandblasting at low pressures or by wire brushing. Wood requires the same consideration as other non-metallic materials, but it must also be free from pitch; otherwise the heat of spraying will destroy the bond.

Carbon resistors and brushes are often sprayed with a thin film of copper or copper alloy to obtain good electrical conductivity. Carbon needs no preparation for spraying.

Glass is sometimes prepared for spraying by sand or grit blasting; however, it is best to heat glass to a temperature which will bring it close to the plastic state and spray the metal directly on the heated glass.

AIR FLOW, HORSEPOWER REQUIREMENTS AND ABRASIVE FLOW WITH STANDARD NOZZLES USED IN BLAST PREPARATION OF SURFACES FOR METAL SPRAYING

Nozzle diameter, in.	3/16	1/4	5/16	3/8	7/16
Recommended hose size, in.	¾–1	1–1¼	1¼–1½	1¼–1½	1½–1¾
Abrasive flow, lb. per hr.:					
Sand	500	900	1200	1700	2200
Steel grit	1250	2250	3250	4250	5500
AIR FLOW IN CU. FT. PER MIN., AND HORSEPOWER REQUIRED AT THE FOLLOWING AIR PRESSURES:					
At 40 lb. per sq. in., gage:					
Air flow	27.50	49.10	76.70	110.00	150.00
Horsepower*	3.26	5.99	9.36	13.42	18.30
At 50 lb. per sq. in., gage:					
Air flow	32.80	58.20	90.70	130.00	178.00
Horsepower*	4.49	7.97	12.43	17.81	24.39
At 60 lb. per sq. in., gage:					
Air flow	37.50	67.00	105.00	151.00	206.00
Horsepower*	5.74	10.25	16.07	23.10	31.52
At 70 lb. per sq. in., gage:					
Air flow	43.00	76.00	119.00	171.00	233.00
Horsepower*	7.22	12.77	20.00	28.73	39.14
At 80 lb. per sq. in., gage:					
Air flow	47.50	85.00	133.00	191.00	260.00
Horsepower*	8.65	15.47	24.10	34.76	47.32
At 90 lb. per sq. in., gage:					
Air flow	52.50	94.00	146.00	211.00	286.00
Horsepower*	10.08	18.05	28.03	40.51	54.91
At 100 lb. per sq. in., gage:					
Air flow	57.88	103.00	161.00	232.00	315.00
Horsepower*	11.98	21.32	33.32	47.90	65.21

*** Horsepowers quoted are for single-stage compression.**

Before metal spraying cracks, they should be opened up with a chisel and dovetailed as much as possible. Sometimes it is advisable to drill a small hole at the ends of the crack to keep it from progressing after spraying

"Good Morning, Jim"

THE BIG BOSS of Company A walks down the shop aisle, greeting the men cordially as he strides by. "Good morning, Jim. I hear you didn't do so well in that bowling tournament last night. Better luck next time." "Hello, Jake. How's your wife feeling now. That was tough to have her sick so long."

Here and there he stops and talks in similar fashion to other men. There is no pretense about him. The men swear by him. They think he is a regular guy. He is modest, unassuming and works harder and longer hours than any of his force. He has had no labor trouble in his shop, principally because the men know that he is a square-shooter.

Company B affords another example of the benefits derived from good employee relations. It was having rough going. It finally reached the stage where it had to lay off a considerable number of men for a prolonged time. Instead of going through the all-too-frequent practice of letting them shift for themselves, it got work for a great many of them 150 miles distant. It was hard on the men to have to move away from their home community, but it was a lot better to find work than to be idle.

Later on the company's business staged a comeback and it needed skilled men. Did the management find it difficult to secure those men? The answer is "No." Its former employees were glad to come back to a company which had shown them such consideration.

These stories are not figments of an editor's imagination. They are true stories. I might cite others but these suffice to show what the essence of true industrial relations is. It is viewing the employee as a human being, as a personality, and treating him as such.

There's been an aura of mystery thrown around industrial relations to make it appear as something highly scientific which only Ph. D.'s in psychology are qualified to practice. Actually, it boils down to use of good old horse sense.

The first rule is to pay good wages. That will do more than anything else to make the relationship right between management and employees. Beyond that it is a matter of the management's treating men the way it would like to be treated.

What is more, no company will achieve the best relationship with its men unless the general manager himself feels that this is an important part of his own job.

Experts in industrial relations can be helpful, and in many cases are essential, but there can be no substitute for the general manager who is an expert in human relations.

Burnham Finney

GAGING BUSINESS

Metal-working activity maintains its accelerated pace, with favorable prospects for continued better business. Government and foreign orders are still prominent.

The metal-working industry is in the midst of an active summer, with prospects favorable for good fall business. The government's defense expenditures are a substantial factor in the current stimulation of operations. Contracts awarded by Federal agencies to metal-working firms the past two weeks amounted to $25,300,000. Export orders too are providing much work in machinery-building plants.

MACHINE TOOLS—July sales may not reach the high total recorded in June, though a considerable portion of the pending foreign inquiries may develop into actual contracts before the month ends. English and French buying continues in impressive volume. Rolls-Royce, Hispano-Suiza and Talbot have been among the leading customers. Unless the armaments race is unexpectedly halted, heavy foreign purchasing of American machine tools is anticipated the remainder of this year. Builders are cheered by a small gain in domestic business. Many dealers who are dependent solely on domestic orders, however, report meager bookings. Army arsenals, notably Rock Island and Springfield, and navy yards have placed important orders. Aircraft parts companies still are major buyers of machine tools. International Harvester has about completed tooling orders for manufacture of its new small tractor. Retooling by automobile makers has brought considerable business to machinery builders, though the total is smaller than last year.

AIRCRAFT—Most companies are loaded with business for months ahead. Shipments in the final six months of 1939 will be substantially larger than in the first six months. United Air Lines has bought six 42-passenger Douglas Super-Mainliners at about $500,000 each. Government has placed large orders with aircraft parts and precision instrument makers. Douglas got a $14,470,000 order and North American Aviation one for $1,569,000 from the Army Air Corps.

SHIPBUILDING—Rapid expansion of operations is continuing. Navy yards are buying large quantities of machine tools. Fore River works of Bethlehem is purchasing new equipment. Electric Boat Co. has been awarded a submarine contract for $2,797,000 by the U. S. Navy. New York Shipbuilding is low bidder, at $13,997,000 on the navy's repair ship *Vulcan*.

STEEL—Operations have risen to 56 per cent. Indications are that mill schedules will be close to the current level the remainder of the summer. Ford is inquiring for 75,000 tons. Most of the recent tonnage has come from miscellaneous sources and from structural buyers. Until output goes still higher and prices strengthen, mills aren't likely to spend much money for new plant equipment.

AUTOMOBILES—Retail sales have been better than anticipated. The tooling period for new models will be relatively short, with companies starting car assemblies in August. September should be a good production month.

TRACTORS — International Harvester is gradually increasing assemblies of its new small Farmall tractor. Early in August it will announce two new tractors of two-plow and three-plow sizes which will be built at Moline, Ill. The new Ford tractor will not be available nationally for several months, initial distribution being confined to the Detroit area.

ELECTRICAL EQUIPMENT—Moderate increases in sales are noted. Household appliances continue to outstrip the 1938 volume by a comfortable margin. Heavy equipment builders with government contracts are running at a good rate. General Electric's orders from January 1 to June 30 were up 32 per cent over the same period a year ago. Graybar Electric was awarded a $710,000 contract for receivers and transmitters for the Signal Corps.

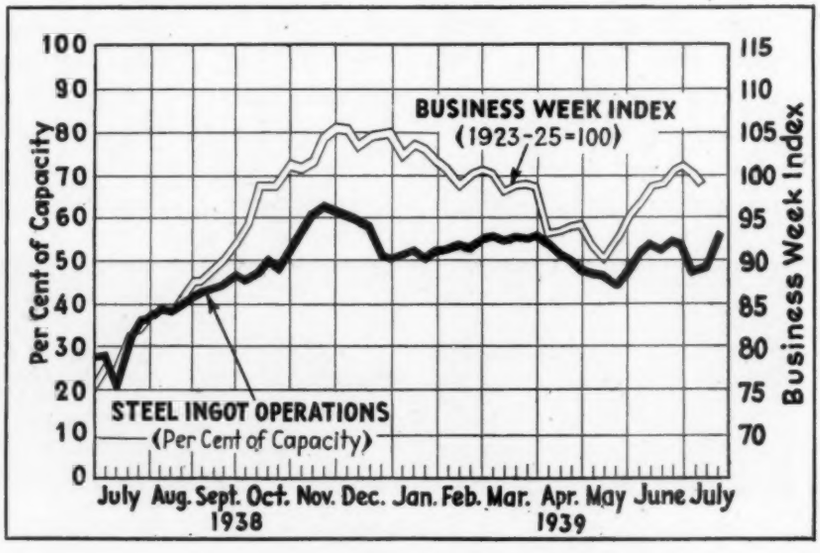
GEARS—June sales were 55 per cent better than in the same month a year ago, according to American Gear Manufacturers Association. The first six months of 1939 showed a gain of 19 per cent over the same period of last year.

FOUNDRY EQUIPMENT—Orders have been more than double the volume reported a year ago, though the backlog of unfilled orders has declined slightly.

WOODWORKING MACHINERY—Activities have been stepped up a bit, partly because of demand from lumber interests in the Northwest.

STEEL INGOT OPERATION VS. GENERAL BUSINESS

Despite the slackening of general business activity, steel operations rebounded from the holiday slump to the highest level in six months



NEWS OF THE INDUSTRY

Most Active Period in Aviation History Proves Boon to Machinery Manufacturers

Huge Backlog of Aircraft Orders Gives Promise of Continued Equipment Buying

NEW YORK—Stimulated by army and navy purchases for the fiscal year 1940 and by foreign buying, the aircraft industry expects the final half of this year to be the most active in its history. Douglas has a backlog of orders totaling $48,000,000, Glenn L. Martin $38,000,000 and United Aircraft $35,515,000. Shipments of some companies, such as Glenn L. Martin, will be five times as great the second half of 1939 as the first half.

Curtiss-Wright is now completing orders for U. S. navy scout bombers and for 200 French army pursuit planes. It will keep busy building small training planes until production starts on its $13,000,000 contract for over 400 P-40 pursuit planes for the Army Air Corps. Fifty training planes will be turned out too for the Turkish air force. Curtiss-Wright has transferred small plane manufacture from St. Louis to Buffalo.

Much secrecy surrounds the details of the new radial air-cooled aircraft engine developed by Pratt & Whitney aircraft for the army. It is known to have 18 cylinders and is believed to be in the same power range as the new Allison engine for which the Army Air Corps recently awarded heavy contracts. The new Allison plant at Indianapolis is being rushed to completion as rapidly as possible.

The French Ford Co. is reported preparing to make the Rolls Royce Merlin engine for the French government. Some of the machinery for this job is understood to have been placed in this country.

INCREASED COMPETITION SEEN IN LOW-PRICE TRACTOR FIELD

DETROIT—With announcement of International Harvester's low-priced tractor, the battle for tractor business is on in full swing. International Harvester could have announced earlier, it is reported, but preferred to wait for Ford's announcement and prices. It was understood around the industry that, if necessary, International Harvester was prepared to go as low as $465 to undersell Ford. Since the Ford tractor price was pegged close to $600, however, International Harvester could still ticket its own at $515.

Additional low-priced tractors are in the offing, including further developments at Ford looking toward still lighter weight and lower cost. It is unlikely, however, that an additional Ford tractor will make its appearance before next spring. The present Ford unit is somewhat of a compromise, composed largely of various standard truck parts.

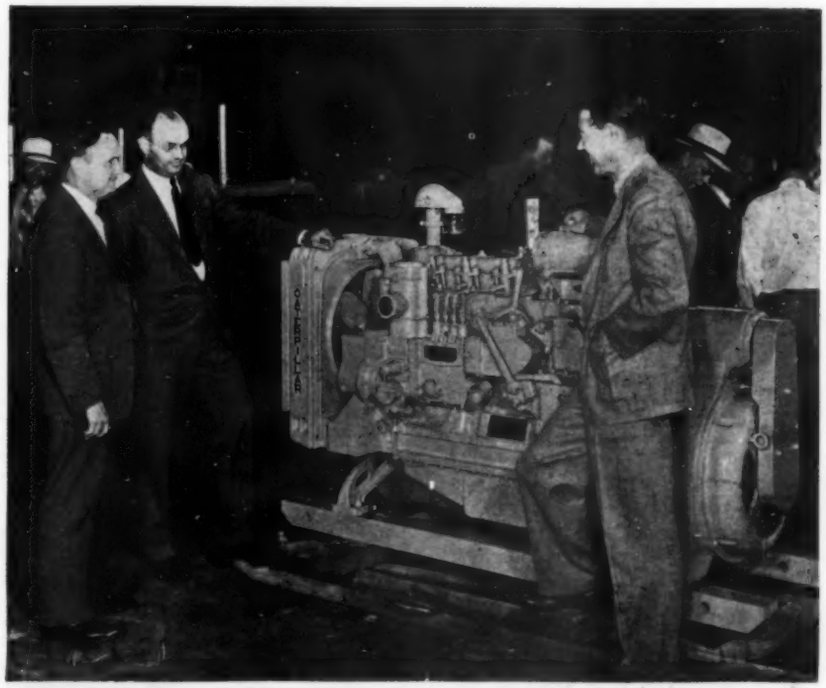
MACHINE TOOL INDEX DROPS

CLEVELAND—The index of machine tool orders, compiled monthly by the National Machine Tool Builders Association, fell off 8 points from the May high to register 211.6 for June, a drop of less than 4 per cent. Total orders reported were 200 per cent above those of June, 1938. Domestic orders increased slightly.

A.W.S. TO MEET OCT. 23-27

CHICAGO—Featuring over 50 discussions of welding developments by various authorities in the field, the 20th annual meeting of the American Welding Society will be held October 23-27 at the Stevens Hotel here, coincident with the National Metal Exposition at the International Amphitheatre.

Officially opening with the president's reception on Sunday, Oct. 22, the meeting will include fifteen technical sessions throughout the week and will be terminated with a business meeting the morning of Oct. 27, and an inspection trip that afternoon through the LaGrange, Ill., plant of the Electro-Motive Corp.



Packaged Power—*Make two connections, fill the tank, and in less than an hour you've got 20 kw. of three-phase power wherever you want it. Built-in electrical accessories and simplified design have reduced to a minimum the expense of installing and operating the new Caterpillar diesel-electric sets. President B. C. Heacock, left, and general sales manager Don Robison, right, admire one of the skid-mounted models*

INSIDE DETROIT

By Athel F. Denham

Car makers rush tooling programs to avoid long shutdowns as sales continue above expectations. Prolonged labor troubles, with no solution in sight, constitute the principal headache.

DETROIT — Buoyed by continued gains the past few weeks in retail car sales, car makers are rushing tooling programs to avoid too long a shut-down. Though production is tapering, the end of the 1939 model season has not come as early as anticipated. As a result July car assemblies will be materially higher than expected.

Primarily responsible for the pickup in new car sales is the opening up of the used car market the past two months. Dealers have been able to unload stocks fairly well, and with the absence of price cuts have taken advantage of "clean-up" trading allowances in keeping sales moving.

Most factories will be concentrating on getting 1940 models lined up by the end of this month. Assemblies of 1940 cars should be well under way by the end of August in several plants.

Packard, originally scheduled to get the jump on the industry, is reported to have run into a snag on body costs for its 1940 six and 120, thus delaying new car assemblies. It is definitely trying to stay in the medium-low priced field with its six.

Several other manufacturers are said to be tooling completely new bodies, notably Plymouth and Buick. Appearance changes will predominate again this year for the industry as whole.

FRENCH FORD PLANT BEING BUILT

DETROIT — A new $5,000,000 assembly plant will be put in operation this fall at Poissy (near Paris) France by the Ford Motor Co. Started last fall on a 65-acre tract, the new plant is distinguished from other Ford assembly plants in that it has facilities for machining and assembling engines. Over $800,000 will be invested in American-made machine tools.

The new assembly plant will be capable of handling 200 cars per day. A foundry is planned later so that engine and other castings can be made. Bodies are obtained either from local vendors or in knocked-down form from the United States. The entire requirements of the French market will be handled from the new plant. It will replace the present Paris plant which is inadequate for manufacturing purposes.

Overhead—*One of the tricks done with a Phillips recessed-head screw is to place it upright on a screwdriver bit and run it into an overhead hole without guidance. Thus the time to drive 36 screws in the header of General Motors truck cabs has been cut 25–50 per cent*

Try to Cut Die Costs

Efforts are being made by some companies to reduce the tremendous annual new die costs. An example is the splitting up by a number of manufacturers of blanking and piercing operations on sheet metal parts. While the combination of these two operations in one had permitted a slight reduction in labor cost in the past, it was more than offset by the cost of the expensive cam dies needed for piercing holes in the blanking presses. Under the new set-up a number of manufacturers now are blanking, then forming and then piercing sheet metal parts.

The piercing operation is performed usually with multiple individual hydraulic punching units mounted on an automatic fixture. Design changes in sheet metal in following years will mean only rearrangement of the individual units with this type of set-up.

More and Better Overdrives

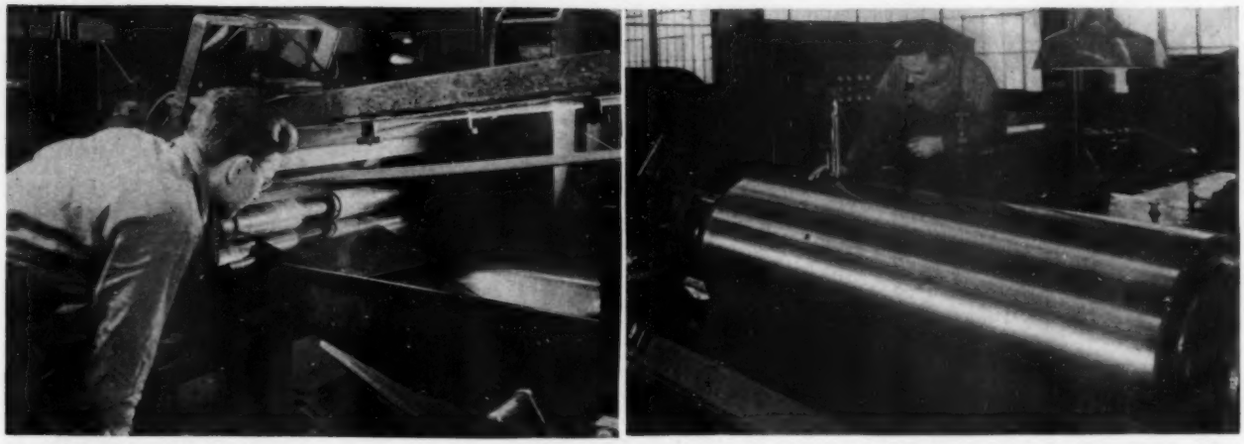
Improvements in shifting mechanisms for transmissions are to be general in 1940 cars to overcome some of the difficulties encountered by placing mechanical shifts on steering columns. Overdrives will be more widely adapted and will be set to cut in at still lower speeds than this year, the public apparently preferring the reduction in motor speed to the greater ease of shifting attending a higher cut-in speed. In a number of cases, however, overdrives will be designed to eliminate free-wheeling except while the shift is being completed.

Another transmission development by a producer of medium and high priced cars involves a new method of finishing gears, which provides gear teeth with a slightly curved face. Quieter operation is said to result from the process.

Labor Battle Drags On

Chief worry of automobile factories at present is the continuing fight between the two U.A.W.'s. Failure to achieve a settlement of the General Motors tool and die strike sponsored by C.I.O. group has surprised no one in the industry. For all practical purposes the strike developed from the inter-union fight between the C.I.O. and A.F.L. groups and was stimulated largely by the flopping of Martin's G.M. strike attempt last month.

General Motors is considered Martin's major stronghold. Apparently the U.A.W.-C.I.O. group figures that



Quality First—*Maintaining top-notch quality at the Irvin works of the Carnegie-Illinois Steel Corp. requires a high degree of instrumentation and extensive use of automatic equipment. Left, an automatic throwout on the tin shear line helps flying micrometers, operating through delay relays, sort plates according to gage. Right, a roll is tested for hardness with the scleroscope*

if it can break through there, the A.F.L. group will be almost entirely out of things in the industry. That this is the real purpose behind the strike is further evidenced by the apparent lack of desire on the part of the union to settle the present strike. The longer it can hold out, the longer it can keep the plants closed, the more it will embarrass Martin with his members among the production workers at these plants and in General Motors generally.

Since the original contract between General Motors and the U.A.W. was based primarily on "production workers", General Motors thought it had a happy solution when it proposed that Thomas' group forget all about the disputed U.A.W. contract ownership and sign a new one to cover the tool and die workers affected. This proposal the C.I.O. group turned down. Possibly Thomas feels that if he can hold on long enough General Motors will have to capitulate completely in order to get its tool and die program completed at a reasonable time. To solidify his position, Thomas endeavored to close down independent tool and die shops working on General Motors 1940 material. The effort, however, met with but slight success.

It is evident that one side or the other will have to make pretty much of an about-face in attitude before a settlement can be made.

While General Motors new model program is thus partially tied up, others are trying to "make hay" and are keeping their fingers crossed.

DISCUSSES CLEANING METHODS

NEW YORK—A 48-page illustrated brochure, portraying the important part that production cleaning and its related operations play in America's leading industries, has been issued by Oakite Products, Inc., in connection with its 30th anniversary.

U. S. Government Contracts Awarded to Metal-Working Firms

(Awarded from June 26-July 8 inclusive)

Contractor	Gov't Agency	Commodity	Amount
Watson-Stillman Co., Roselle, N. J.	Navy, S. & A.	Hydraulic press	$58,500
Miehle Printing Press & Mfg. Co., Chicago, Ill.	Gov. Print. Office	Printing presses	144,845
American Type Founders, Inc., Elizabeth, N. J.	Gov. Print. Office	Presses	58,410
American Engineering Co., Philadelphia, Pa.	Navy, S. & A.	Windlasses	47,950
Buffalo Forge Co., Buffalo, N. Y.	Navy, S. & A.	Ventilating equipment	119,281
General Electric Co., Schenectady, N. Y.	War, T. V. A.	Electrical apparatus	174,244
Bell Telephone Laboratories, New York, N. Y.	C. A. A.	Radio stations	40,000
Federal Telegraph Co., Newark, N. J.	Treasury, U. S. C. G.	Radio transmitters	35,746
Bendix Radio Corp., Baltimore, Md.	War Signal Corps.	Frequency set	199,678
Wright Aeronautical Corp., Paterson, N. J.	Naval Air Fact.	Engine, parts, tools	460,260
United Aircraft Corp., Hamilton Standard Propeller Div., East Hartford, Conn.	Navy S. & A.	Propeller assemblies	33,775
Bendix Aviation Corp., Eclipse Aviation Div., Bendix, N. J.	War, Air Corps	Miscellaneous parts	54,389
Bendix Aviation Corp., Bendix Products Div., South Bend, Ind.	War, Air Corps	Wheels, brakes, carburetors	65,460
Higgins Industries, Inc. New Orleans, La.	Navy, S. & A.	Hull, fittings	119,700
American Car & Foundry Co., New York, N. Y.	Navy, S. & A.	Hull, fittings	233,358
Defoe Boat & Motor Works, Bay City, Mich.	Navy, S. & A.	Hull, fittings	1,255,000
Pioneer Instrument Co., Bendix, N. J.	War, Air Corps	Aircraft instruments	155,042
Lukenweld, Inc., Coatesville, Pa.	Navy, S. & A.	Slides, carriages, base rings	60,948
Bantam Bearings Corp., South Bend, Ind.	War, Ordnance	Roller bearings	149,640
Pollak Mfg. Co., Arlington, N. J.	Navy, S. & A.	Cartridge containers	43,065
Allis-Chalmers Mfg. Co., Milwaukee, Wis.	Procurement, Farm Sec.	Tractors	37,104
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.	Navy, S. & A.	Drilling machine	22,966
Cleveland Automatic Machine Co., Cleveland, Ohio	War, Ordnance	Screw machine	15,603
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.	Navy, S. & A.; War Ordnance	Jig borer, profilers	34,505
Cincinnati Planer Co., Cincinnati, Ohio	Navy, S. & A.	Planer	20,986
A. B. Farquhar Co., York Pa.	War, Ordnance	Hydraulic press	20,610
Hendey Machine Co., Torrington, Conn.	War, Ordnance	Rebuilding lathes	22,084
Ex-Cell-O Corp., Detroit, Mich.	War, Ordnance	Grinder	11,996
Lodge & Shipley Machine Too Co., Cincinnati, Ohio.	Navy, S. & A.	Engine lathe	14,070
Colonial Broach Co., Detroit, Mich.	War, Ordnance	Broaching machines	28,060
Kingsbury Machine Tool Corp., Keene, N. H.	War, Ordnance	Drilling and reaming machine	12,570
Sanitary Refrigerator Co., Fond du Lac, Wis.	War, Q. M. C.	Refrigerators	36,460
Manning, Maxwell & Moore, Inc., Bridgeport, Conn.	Navy, S. & A.	Valves	59,166
Finnel System, Inc., Elkhart, Ind.	Interior	Floor scrubbing machines	33,900
United Aircraft Corp., Pratt & Whitney Aircraft Div., East Hartford, Conn.	Navy, S. & A.	Engines	1,448,977
Banner Die Tool & Stamping Co., Columbus, Ohio	War, Air Corps	Bomb rack assemblies	39,600
Edward G. Budd Mfg. Co., Philadelphia, Pa.	War, Air Corps	Wing panels	42,204
Pump Engineering Service Corp. Cleveland, Ohio	War, Air Corps	Pump assemblies	101,262
Fogal Boat Yard, Inc., Miami, Fla.	Navy, S. & A.	Hull, fittings	89,874
Fisher Boat Works, Inc., Detroit, Mich.	Navy, S. & A.	Hull, fittings	102,325
Sperry Gyroscope Co., Brooklyn, N. Y.	War, Ordnance	Cams, dials	34,950
Keuffel & Esser Co., Hoboken, N. J.	War, Ordnance	Height finders	542,082
Kollsman Instrument Co., Elmhurst, N. Y.	War, Air Corps	Aircraft instruments	123,121
Bell & Howell Co., Chicago, Ill.	War, Signal Corps.	Projecting machines	70,888
Fairchild Aerial Camera Corp., Jamaica, N. Y.	War, Air Corps	Caeras	103,570

WATCHING WASHINGTON

McGraw-Hill Washington Bureau

PAUL WOOTON, CHIEF

Emphasis remains on defense as Congressional activity shows little sign of waning. Principal attention centers on measures pertaining to aircraft and naval vessels.

WASHINGTON—Congress is wary about giving the War Department power to dicker for prices with aircraft companies, thus setting aside the lowest-bidder rule. Assistant Secretary Louis Johnson would like to have such power, including possibly the right to award some contracts on a cost-plus basis. The War Department says that at present only four or five airplane makers are getting the government's business because little companies cannot afford to spend a necessary half-million dollars for demonstrator planes of new design. The result is that the whole expansion program is slowed down and the smaller firms are not being educated for an emergency. A three-man subcommittee on Military Affairs in the House is drafting a compromise which would permit business to be given to the second and third lowest bidders. Experts do not feel that this will solve the Army's problem. Many congressmen do not admit the Army has a problem. When high-ups talk about an "emergency," congressmen ask, "What emergency?"

Experiment with Torpedo Boats

Six torpedo motor boats ordered by the Navy are for purely experimental purposes and will not be built in volume as yet, officials insist. Reports that a mosquito fleet is to be put aboard carriers apparently are premature. It is pointed out that the boats are not capable of being hoisted; that they will all be shore-based. Authorities admit that a "carried" fleet of torpedo mosquitos is within the realm of possibility, but they say that small boats cannot speed on the open sea, are usually effectively only in sheltered water. The experiments are being conducted under a $15,000,000 authorization in the Big Navy Act of last year.

Await Educational Orders Funds Decision

Educational orders got only $14,250,000 from Congress instead of the $32,500,000 requested. The 14 millions, however, was for one year instead of two, so it wasn't really a cut. But friends of the War Department right now are making a strenuous effort to assure the 32 millions by having the balance put in the third deficiency bill. Meanwhile the ordnance department committee is holding up its allocation plans, which were completed on the basis of the big figure. Whether the total amount is available this year will make a big difference in how orders are distributed among manufacturers and in the amounts assigned to the different items. Further announcement can be expected when Congress adjourns.

Debate Naval Vessel Costs

Hearings have started on a bill by Representative Carl Vinson, Chairman of the House Naval Affairs Committee, requiring that one or more Navy Yards submit estimates of cost before ship construction awards are made. Vinson offered the bill as a result of an award for building the airplane carrier *Hornet* on a single bid of $31,800,000 by Newport News. The same company contracted to build the *Yorktown* and *Enterprise*, both of the same tonnage and design as the *Hornet*, for $19,000,000 each. The Navy opposes the bill on the ground that it is common practice already to furnish estimates, that the increased cost of the *Hornet* was based on higher labor, material and other costs.

EYES ON JAPAN

Machinery builders may well keep their eyes on developments in Japanese-American trade relations. There is considerable sentiment in Washington for imposing countervailing duties on Japanese goods and virtually putting the Japanese on the so-called trade blacklist along with Germany. Hesitation is shown in placing an outright embargo on Japanese goods because of the possible dislocating economic effects of such a policy in this country. The Japanese are well aware of the feeling against them in the United States and are doing what they can privately to counteract such sentiment. Japan is reported to have taken some machinery from American builders and stored it rather than put it to immediate use. Perhaps this is a safeguard against the day when there may be an interruption of the regular trade relations between the two countries.

Ridicule "Overbuilding" of Battleships

Some observers say that the Navy will over-build its 35,000-ton battleships to nearer 45,000 tons, and that the 45,000-ton ships will approach 55,00 tons. Obviously any such overbuilding would have to be premeditated; it couldn't be miscalculation. Navy officials lift their eyebrows at such talk. They say it would be next to impossible, even if they wanted to do it. After Japan repudiated the naval limitations treaty, the United States agreed with England and France on a top of 45,000 tons, with maximum 16-inch guns. The government would not overstep this limit without a new agreement. Besides, the 45,000 figure is an act of Congress.

Favor Walsh-Healey Amendments

Amendments to the Public Contracts Act (Walsh-Healey) passed by the Senate and sent to the House for approval would (1) make the law applicable to minimum contracts of $4,000 instead of $10,000; (2) add to the present scope of the law contracts for services and construction of ships; (3) blacklist firms found by courts to have violated the law and bar them from bidding; (4) coordinate child labor law with wage-hour law; (5) require that basic minimum wage be not lower than Wage-Hour minimum, whether statutory or set by industry committees.

Speed All Phases of Defense

F.D.R. orders eight-hour day suspended when work starts soon on Army-Navy air bases in Pacific and Atlantic. . . . More air transport companies will follow United's lead in purchasing four-motored equipment. . . . Bland bill authorizing Maritime Commission to subsidize domestic shipping through "trade-in" of obsolete vessels passes House, goes to Senate. . . . It probably was Asst. Sec. of Navy Edison who got F.D.R. to change his mind again and ask for money to start work on a rigid airship for Navy. . . . There is talk of two more 45,000-ton battleships in 1941; these could be built without further legislation. . . . When you read this the united farm bureaus will have attempted to substitute their own amendments for the Andrews-Norton amendments to the Wage-Hour law; no action on amendments this session was the predicted result. . . . Reminding you that the third of the 35,000-ton battleships is on the ways; three more 35's and two 45's are coming.

FORMER EX-CELL-O PRESIDENT NOW HEADS OWN ORGANIZATION

DETROIT—N. A. Woodworth, formerly president of the Ex-Cell-O Corp., has announced the formation of his new organization, the N. A. Woodworth Co., located at 9111 Schaefer Highway. Associated with Mr. Woodworth in the new venture are E. W. LaMonte, formerly connected with the Swartz Tool Products Co., and J. F. Benner, formerly associated with the Partool Machine Co.

The N. A. Woodworth Co. has acquired the plant and facilities of the Partool Machine Co., a factory of modern design and construction and containing approximately 15,000 sq.ft. of manufacturing space. Activities at the outset will be directed toward precision tool and machine work as well as machine tool work.

N. A. WOODWORTH

S. HORACE DISSTON

S. HORACE DISSTON, since 1936 vice-president and general manager Henry Disston & Sons, Inc., Philadelphia, Pa., has been elected president. He succeeds HENRY DISSTON, who has been made chairman of the board. WILLIAM D. DISSTON has been made vice-president in charge of purchases, sales engineering and new products development.

S. HORACE DISSTON first became associated with the firm in 1899, spending eleven years in the saw and file shops. He later handled various office duties until 1921, when he was placed in charge of hardware sales.

E. G. GARDNER, former vice-president and works manager Grand Rapids Brass Co., Grand Rapids, Mich., has been named vice-president in charge of manufacturing of the National Enameling & Stamping Co., Milwaukee, Wis.

J. T. GILLESPIE, JR., has been named assistant to the president Wilson Welder & Metals Co., an affiliate of the Air Reduction Sales Co., New York, N. Y. He was formerly assistant manager of Airco's Central Division of Railroad Sales in Chicago.

H. J. HOOKS, former secretary and treasurer Wolverine Tube Co., Detroit, Mich., has been elected president. He succeeds C. C. LIMBOCKER, who has been elected chairman of the board. V. D. HANNA, former assistant secretary and treasurer, has been named secretary and treasurer.

HAROLD T. HULETT, former head of the commercial refrigeration activities of the General Electric Co. at Cleveland, Ohio, has been named sales manager in charge of distribution in the company's recently combined air-conditioning and commercial refrigeration activities at Bloomfield, N. J. ELLIOTT HARRINGTON, associated with the department since its inception, has been appointed product sales manager. S. MARTIN, JR., has been named manager of the installation and service division.

R. H. GAITHER has resigned as general manager of the Elliott Co., Ridgway, Pa., steam power specialties manufacturer. He is succeeded by JAMES DIXON, New York, N. Y.

GEORGE SCHAEFER, former rolling mill design engineer Farrel-Birmingham Co., Ansonia, Conn., has been appointed manager of the rolling mill machinery sales division. He succeeds NORMAN SHAW, who has been appointed manager of the company's Chicago office. Mr. Shaw in turn succeeds HARRY TEMPORAL, who has been transferred to the Buffalo division.

WILLIAM O. LIPPMAN

WILLIAM O. LIPPMAN, former superintendent of the air-conditioning division of the East Springfield, Mass., works of the Westinghouse Electric & Mfg. Co., has been appointed works manager.

Mr. Lippman first joined Westinghouse in 1918 following his graduation from Pennsylvania State College. He remained in the company's East Pittsburgh works until 1923, when he was transferred to the East Springfield works as supervisor of the inspection and testing department. Later he took charge of the industrial relations department, and in 1936 was appointed superintendent of the motored appliance division.

EVERETT S. CARPENTER has been appointed head of the Rhode Island factory inspection division, succeeding HUGO F. ZAMBARANO.

CHARLES H. MORSE, 3RD, has resigned as assistant general manager of the Beloit, Wis., works of Fairbanks, Morse & Co., to assume active management of the Inland Utilities Co. of which he is president.

LON WILEY, former assistant trim superintendent at the Janesville, Wis. plant of the Fisher Body Corp., has been named superintendent. He succeeds GLENN WISMER, who has been transferred to a similar post at the firm's Tarrytown plant.

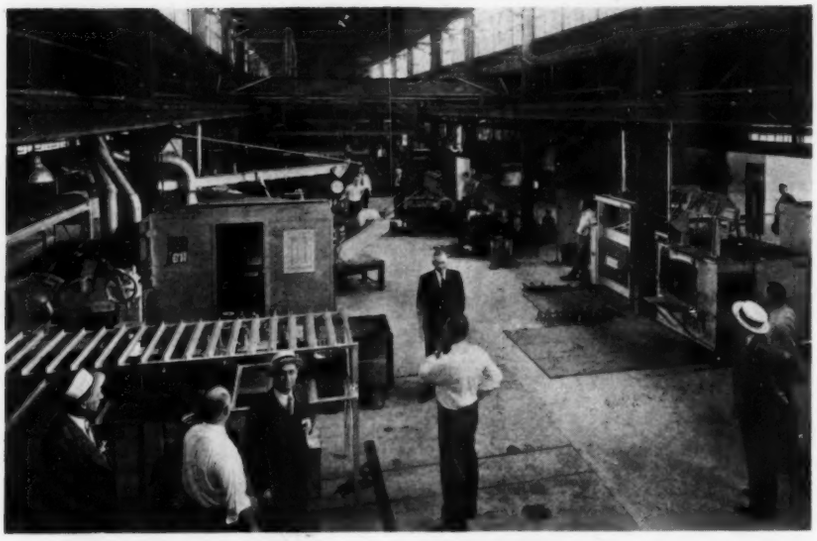
PERSONALS

RALPH J. CORDINER, manager of the appliance and merchandise department of the General Electric Co., Bridgeport, Conn. has been elected president of Schick Dry Shaver, Inc., Stamford, Conn.

FREDERICK M. DARNER has been appointed assistant chief engineer of the Republic Steel Corp., Cleveland, Ohio. He was formerly identified with the Bucyrus-Erie Co. and the Erie Malleable Iron Co., Erie, Pa.

E. E. HINTZ has been named plant manager of the Fisher Body Corp., Janesville, Wis., succeeding MARVIN OLSON, who has been transferred to a similar position at the firm's Baltimore plant.

W. H. C. SMITH, assistant manager of the construction materials sales division of the General Electric Co., Bridgeport, Conn., has retired.



Another Open House—*The 25th birthday of Ampco Metal, Inc., was celebrated with an open house held in its Milwaukee plant. Indications point to a continued expansion of the company, according to C. J. Zaiser, president and general manager*

BUSINESS ITEMS

Curtiss Propeller Div., Curtiss-Wright Corp., for the second time within the past year is expanding its plant at Clifton, N. J. Major item in the expansion program is the construction of a new machine shop with approximately 35,000 sq.ft. of floor space, which, after the installation of new machine tools and other facilities, will increase the plant's complete manufacturing equipment to more than double that now in operation. Entire expansion of plant and manufacturing facilities is planned to be completed by the middle of September.

General Electric Vapor Lamp Co., Hoboken, N. J., has been merged with the incandescent lamp department of the General Electric Co. Because of this change, by which General Electric's activities in incandescent and electric discharge lamps are brought together, the organization's incandescent lamp department will hereafter be known as the lamp department of the General Electric Co.

W. S. Hirschman Co., Buffalo, N. Y., ventilating machinery manufacturer, has purchased a factory building in Lackawanna, N. Y., where it will soon start the manufacture of roof ventilators and auxiliary sheet metal equipment. The company also has a plant in LeRoy, N. Y., which will continue the production of similar equipment.

Koppers Co., Pittsburgh, Pa., has acquired exclusive United States license for the manufacture and sale of Fast's multiple oil film bearings. A companion product to the Fast self-aligning coupling which the organization has been producing for many years, the new type bearing will be manufactured by the company's Bartlett Hayward Div. in Baltimore, Md.

Clausing Mfg. Co., Ottumwa, Iowa, manufacturer of precision screw-cutting bench lathes, formerly a proprietorship, is being incorporated with a capital stock of $24,000.

OBITUARIES

DANIEL DANIELS, 75, founder D & P Pump & Supply Co., Los Angeles, Calif., died June 27 in Santa Monica, Calif.

ALVAH B. WAY, former secretary and general manager Bridgeport Chain & Mfg. Co., Bridgeport, Conn., died July 16. He was 65 years of age.

RALPH W. GRANT, plant manager of the Clifton, N. J., division of the National Rubber Machinery Co., died June 27.

WILLIAM B. ALLBRIGHT, president and founder Allbright-Nell Co., Chicago, Ill., meat packing machinery manufacturer, died July 11 following an extended illness. He was 63 years of age.

MEETINGS

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Joint meeting with the Institute of Mechanical Engineers of Great Britain, New York, N. Y., Sept. 4–8.

AMERICAN SOCIETY OF TOOL ENGINEERS. Semi-annual meeting, Hotel Statler, Cleveland, Ohio, Oct. 5–6.

AMERICAN WELDING SOCIETY. Twentieth annual meeting, Stevens Hotel, Chicago, Ill., Oct. 23–28.

MACHINE TOOL SHOW AND CONGRESS, sponsored by the National Machine Tool Builders Association, Public Auditorium, Cleveland, Ohio, Oct. 4–13.

NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION. 1939 conference, Hotel New Yorker, New York, N. Y., Sept. 20–22.

PACKAGING INSTITUTE. First annual meeting, Edgewater Beach Hotel, Chicago, Ill., Oct. 12–13.

PORCELAIN ENAMEL INSTITUTE. Fourth annual forum, Ohio State University, Columbus, Ohio, Oct. 18–20.

SILVER BAY INDUSTRIAL CONFERENCE. Annual meeting, Silver Bay, Lake George, N. Y., Aug. 30–Sept. 2.

SOCIETY OF AUTOMOTIVE ENGINEERS. National aircraft production meeting, Ambassador Hotel, Los Angeles, Calif., Oct. 5–7. Annual dinner, Hotel Pennsylvania, New York, N. Y. Oct. 16.

Rolling Along—*Designed by Albert Kahn, Inc., the 190x220-ft. roll shop of the Ohio Steel Foundry Co. at Lima, Ohio, has been laid out to accommodate as much heavy equipment as many larger shops. Machine and building foundations will isolate vibration for precision work*

SHOP EQUIPMENT NEWS

High-production Gear Finisher Built for Heavy-Duty Service

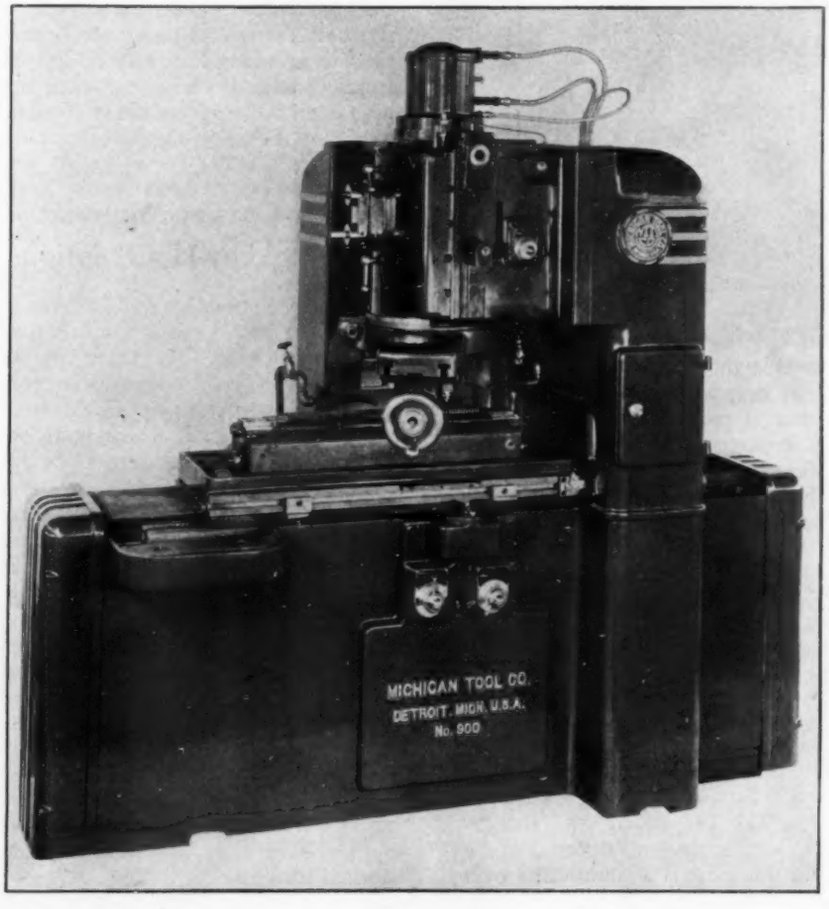
The model 900 gear finisher, built by the Michigan Tool Company, 7171 E. McNichols Rd., Detroit, Mich., has been designed to supplement the standard but smaller Michigan 854 rack-type gear finisher. The larger unit is hydraulically operated and uses this company's cross-axis "shaving" method of cutting and basic principle of operation in that the gear is cut by means of serrated cutters in a reciprocating horizontal rack with which the gear is meshed by feeding the work carrying head downward toward the rack.

In addition to hydraulic operation of the rack table, the model 900 unit features hydraulic operation of cross-feed of the head and down-feed of the gear. The cross-feed is designed so as to reciprocate the gear across the rack at a constant but adjustable rate of speed. The length of the stroke across the rack and the transverse portion of the rack over which the gear is reciprocated are also adjustable. These features were adopted to simplify the set-up, to reduce set-up time, to improve finish, to improve gear quality, and to obtain a more even distribution of wear over the rack.

The hydraulic down-feed mechanism comprises a rapid approach and slower cutting feed; the cutting feed is adjustable by means of a single valve from 0.0005 in. to 0.0025 in. per cycle of the table. Automatic stops are provided to stop the down-feed when the gear has been properly sized. A dial setting is used to stop the rack automatically after the desired number of finishing strokes. The head then automatically raises through a rapid return, clearing the gear for unloading and reloading. The effective length of stroke in this model is 3 in. greater than on the model 854.

A coolant system has been designed especially for this machine, having six separate compartments arranged for the progressive deposition of foreign matter. A central lubrication system is provided to automatically oil all vital parts of the machine each time a gear is finished.

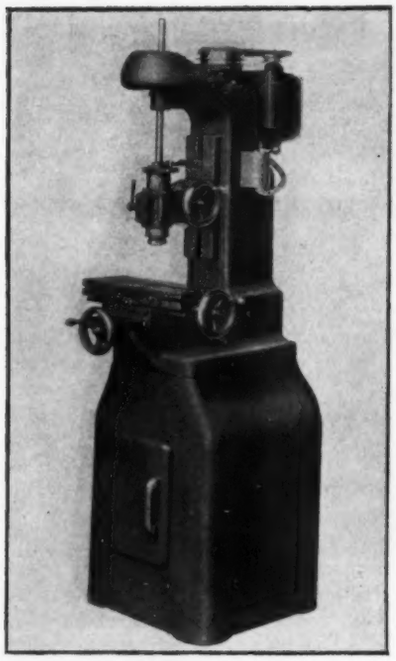
This machine, weighing 9,600 lb., is designed to finish gears up to 8-in. diameter, with maximum length between centers of 18½ in. It is operated by a 5-hp., 1,200-r.p.m. electric motor located in the base of the machine.



Improvements Are Made In Linley Millers

Linley Brothers Co., 12 Montauk St., Bridgeport, Conn., have announced that improvements have been made in fitted parts of its high-speed vertical milling machine and jig borer, and that a lock has been added to the table. The table hand wheel is now on the right instead of the left side of the machine, and a ½-hp. motor is furnished instead of the ¼-hp. motor formerly used. This machine was completely described last year (*AM*—Vol. 82, page 942). In addition to being streamlined, the entire machine has been made heavier throughout and the added weight has been distributed to points where rigidity is needed.

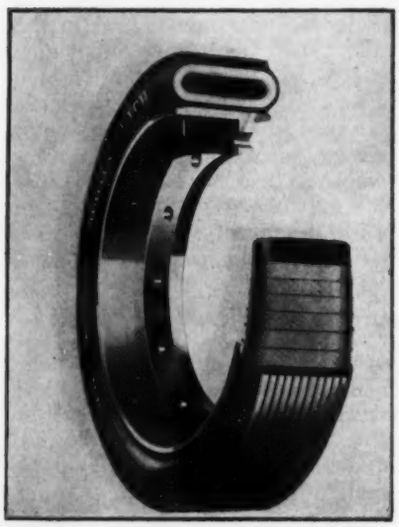
Specifications of the floor-type unit: Table size, 5½ x 14½ in.; longitudinal travel of table, 10 in.; cross travel of table, 5 in.; table top to spindle end, maximum 9 in.; movement of sliding head, 8 in.; spindle travel, 3 in.; spindle center to column ways, 5¾ in.;



spindle center to column below ways, 6¾ in.; spindle speeds, 275 to 4,250 r.p.m.; collet capacity, ½ in.; height over pulleys, 59 in.; weight, 800 lb. The bench machine specifications are the same, with the exception that the height over the pulleys is 32½ in., the bench space required is 12½ in. wide by 16½ in. deep, and the shipping weight is 480 pounds.

Friction Clutch Designed With Rubber Liners

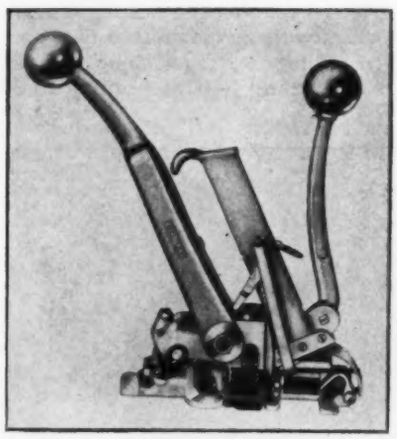
The General Tire & Rubber Co., Akron, Ohio, has announced that its new subsidiary, the Fawick General Co., has been organized to manufacture a rubber clutch with multi-vaned surfaces. Adhesion is obtained through friction liners riveted to brass plates which are in turn vulcanized to the clutch gland on both the expanding and constricting types of clutch. A complete line, designated as "Airflex" clutches, is being developed for machine tools, conveyors, diesel electric generators, and similar uses, as well as for the larger applications in the marine engine and oil-well fields. The largest unit made to date is a 40-in. clutch for a marine engine of 3,000-hp. capacity.



Automatic Tool Straps Containers Quickly

The "Ace" strapping tool, recently announced by The Stanley Works, New Britain, Conn., is equipped with an automatic seal feed, has a magazine loaded with a clip of 100 seals, and is available in three sizes for ¼-in., ⅜-in., and ½-in. strapping. A positive spring feed holds the seals in any position.

After the strapping is fed into the tool, a few quick pulls on a tension lever tightens the strapping. With the strapping tensioned, a second lever is pushed forward cutting the strapping and automatically sealing it. The complete operation requires only these two motions, the sealing being accomplished in about five seconds.



Stamper Used on Material Up to 2-in. Thickness

A machine that will stamp letters or figures on thick blocks, pieces or parts, and on nameplates after assembly as well as before assembly, was recently announced by H. O. Bates, 966, 251–257 N. Broad St., Elizabeth, N. J. Stamping on material of varying thickness is accomplished by adjustment of a pressure screw beneath the work table. Most any material up to the hardness of stainless steel can be stamped, including untempered alloy and carbon steels, half-hard brass, chrome plated brass, various plastics, woods, etc.

The machine has a heavily ribbed gray-iron frame, a work table with in-and-out adjustment, and is equipped with standard alloy steel dies from $\frac{1}{16}$-in. to $\frac{5}{16}$-in. sizes. Selection of letters or figures is accomplished by turning a character wheel; each character is snapped into position by a hardened steel pin and spring indexing arrangement at the back of the wheel. Letter spacing is accomplished by turning a handle on the machine, or by means of a semi-automatic advance at each stroke of the operating lever.

Rack Coating Material Unaffected by Hot Solutions

United Chromium, Inc., 51 East 42nd St., New York, N. Y., announces the development of "Unichrome" Rack Coating-W to be used primarily for coating plating racks of all descriptions with a material which will not be affected by boiling cleaners or by plating solutions in general use, including chromium. It is reported that the coating contains no ingredients which are in any way harmful to the plating baths into which the coated rack is introduced.

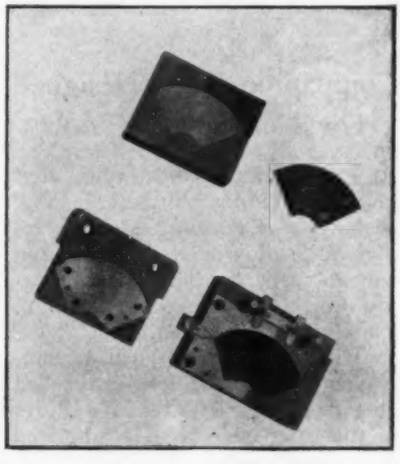
The material is white in color so that any uncovered portions of racks may be readily seen. The racks are dipped in the coating, each coat being subsequently force dried at a temperature of about 200 deg. F. The drying operation for each coat requires about one hour. Ten coats are usually applied. The material will withstand normal handling.

"Micromoto" Unit Improves Processing

Designed for use in conjunction with many types of existing control equipment, the "Micromoto" reset has been developed by the American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn., for use in all processes where widely varying load conditions have previously made automatic control difficult. This unit has been designed to return the controlled variable to a given point after a load change occurs. It begins to function as soon as the load starts to change, and brings the controlled temperature or pressure back to the correct point as rapidly as the process will permit. Accurate control is assured.

Cost of Manufacturing Duct Fittings Reduced

A method of producing elbow cheeks for air-duct fittings on a standard foot press with the aid of two special sets of punches and dies, one for blanking and one for forming, has been announced by the Whitney Metal Tool Company, 105 Mill St., Rockford, Ill. The die sets can be applied to or removed from a No. 58 foot press in two minutes. The blanking die cuts the piece out of flat sheets and the forming die turns up both flanges on the curves in one operation. Tests have shown that pieces can be blanked and formed complete at the rate of

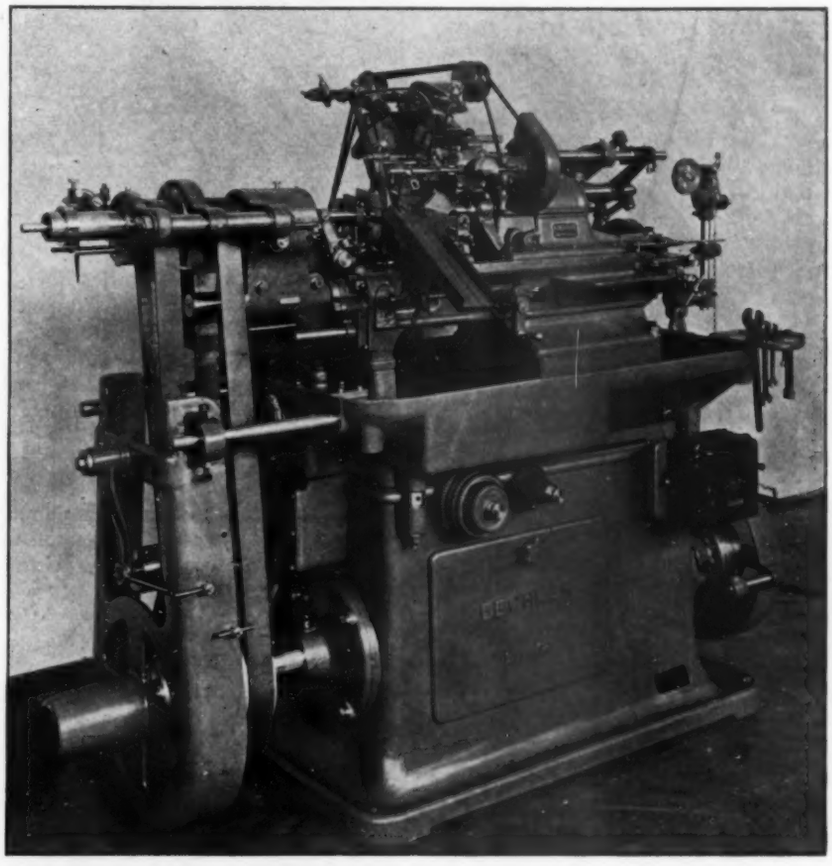


200 pieces an hour, including setting up time.

It is reported that the cost for machine-made pieces is only 50 cents per 100 pieces. Based on this production, a labor cost saving amounting to $98.56 per 8-hour day can be effected by the machine method over a similar production by hand, time studies having shown that hand-made pieces can be produced only at the rate of $6.66 per 100 pieces.

In addition to these dies, this company is introducing a V-die unit for the No. 58 foot press by means of which straight 90-deg. flanges up to 7 in. long can be formed in a pressing operation. This can be used for making duct elbows with straight extensions on either or both sides of the radius, and for other common flanging operations.

Bechler Precision Screw Machines Now Offered In Large Sizes



The Triplex Machine Tool Corp., 125 Barclay St., New York, N. Y., announces that it is marketing the Swiss Bechler model BE automatic screw machines which are built in $\frac{1}{2}$-, $\frac{5}{8}$- and $\frac{3}{4}$-in. capacities. The operating features of the BE series are substantially the same of the smaller Bechler AE series which are built in $\frac{1}{8}$-, $\frac{1}{4}$- and $\frac{3}{8}$-in. sizes.

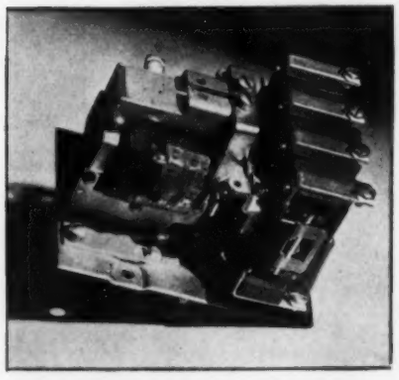
In the Bechler machines none of the tools have longitudinal travel, but the stock travels intermittently past the tools. The headstock spindle, which rotates the bar stock, advances and recedes along a slide and pushes the bar through a fixed steady bushing located just behind the tools. The machines have four tool holders, two horizontal and two vertical. Each tool works independently of each other, and is provided with double micrometer adjustments to within 0.0005 in. The two horizontal tools are mounted on a rocker carrier which pivots about a bearing and which is actuated by a cam in such a manner that the tools are fed alternately into and out of the work.

Generally, the front horizontal tool does the longitudinal turning while the back longitudinal tool does the cutting off. The vertical tools are arranged for doing such operations as forming, knurling, recessing, etc., when required; their slides advance downwards alternately to feed into the work and recede upwards when not cutting. In addition to these tools, there are two scraped surfaces at the

front of the machine arranged to take various plain and combined attachments for drilling, threading, tapping, slotting, etc., which operations are generally performed simultaneously with those of the previously mentioned longitudinal and vertical tools. All attachments and cams for the model BE ½-in., ⅝-in. and ¾-in. capacity machines are interchangeable. Likewise the attachments for the ⅛-in., ¼-in., and ⅜-in. model AE machines are also interchangeable.

Relays for Built-in Use Have From 2 to 8 Poles

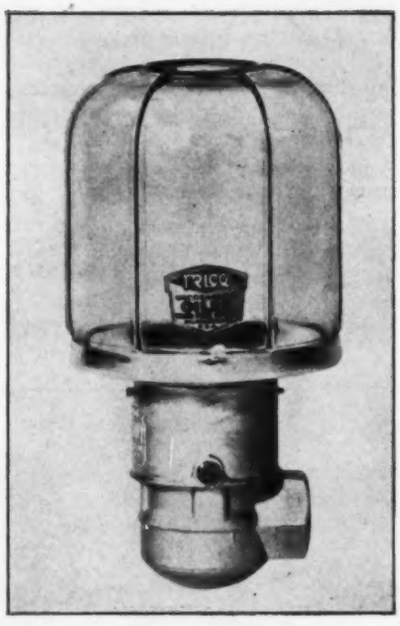
Multi-pole contactors rated at 10 amps., 500 volts maximum, and available in 2 to 8 pole forms in any combination of normally open or closed contacts for the most complicated control system, have been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., for machine



tool control and other built-in control applications. In addition to individual relays, there are assemblies of two relays mechanically interlocked. Latched-in contactors or relays also have been developed. After their own coils operate the units, the coils may be de-energized but the contactor will remain in a latched-in position until a separate releasing solenoid is energized.

Constant-Level Oiler Is Unbreakable

A line of visible automatic constant-level oilers, with unbreakable reservoirs and adjustment oil-level features, has been announced by the Trico Fuse Mfg. Co., Milwaukee, Wis. The reservoirs, designed with reinforcing ribs, are mounted on a casting which in turn is attached to a lower casting by a threaded spout. The oilers are made in 1-, 2-, 4- and



8-oz. capacities with all bottles interchangeable. Two styles for standard surge and high surge levels are available; both styles have side outlets only and also side and bottom outlets for either bottom connection or draining purposes.

The oiler is designed to maintain automatically the proper oil level in ring or ball bearings, gear and pump housings, etc., and to reduce maintenance expense, bearing failures, waste of oil or grease, fire hazards, etc.

Bench Designed For Small Lathes

An all-steel welded bench of rigid construction and having no sharp corners in which dirt or chips might collect, and no angular projections to form a hazard to the workman, has been designed by the South Bend Lathe Works, South Bend, Ind., for South Bend precision bench lathes. Around the top of the bench is a

deep rolled rim which serves as a chip pan or oil pan. The sides and back of the bench are inclosed with smooth panels, but the front is open to permit the operator to take a comfortable working position. The late motor-drive equipment is located on the left side of the bench, while at the right side are three drawers for storage of chucks, tools and accessories. The bench is built entirely of metal, and is fabricated by electric welding.

"Drybrow" Sweat Pad Made of Cellulose

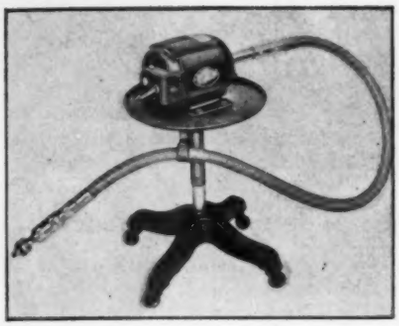
Made of duPont fine-pore cellulose sponge, the "Drybrow" sweat pad offered by the American Allsafe Co., 210 Franklin St., Buffalo, N. Y., is capable of absorbing 20 times its weight in moisture. Said effectively to prevent perspiration from trick-

ling into the eyes and blurring the vision, this device consists of a flat piece of the sponge bound at the ends with tape and equipped with a one-piece rubber headband.

Companion Units Designed For Heavy-Duty Tools

A low-priced line of flexible shaft tools for grinding, polishing, buffing, rubbing, wire brushing, sanding, filing and drilling operations, has been announced by the Stow Manufacturing Co., Inc., Binghamton, N. Y. This line, to be known as the "Stow Junior," has been designed as companion units to the long-established Stow heavy-duty tools. Many features of the latter have been incorporated in the new models.

The first of the Stow Juniors to be placed on the market is of the adjusable pedestal type mounted on a four leg metal base with ball bearing casters. It incorporates motor, extension cord and plug, flexible shaft and clamp spindle. Connection can be

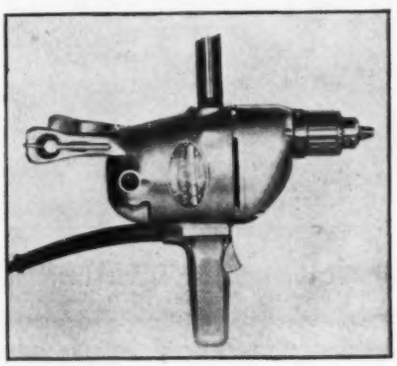


made with any light socket. Standard Stow attachments used on the heavy-duty models are also specified for the Stow Juniors.

Units using motors of either $\frac{1}{4}$, $\frac{1}{3}$ or $\frac{1}{2}$ hp. can be obtained, with two choices of speeds—1,725, or 3,450 r.p.m. The $\frac{1}{4}$-hp. tool has a $\frac{3}{8}$-in. flexible shaft, 5 ft. long. Its maximum wheel capacity is 4 in. x 1 in., and maximum drilling capacity is $\frac{1}{4}$ in. The $\frac{1}{3}$- and $\frac{1}{2}$-hp. tools have a $\frac{1}{2}$-in. x 6-ft. shaft, a maximum wheel capacity of 6 in. x 1 in., and a maximum drilling capacity of $\frac{3}{8}$ in.

Portable Tools Reduced in Size and Weight

Seven units in the line of portable tools manufactured by the Van Dorn Electric Tool Co., Towson, Md., have been redesigned for less weight, more compactness and greater durability.

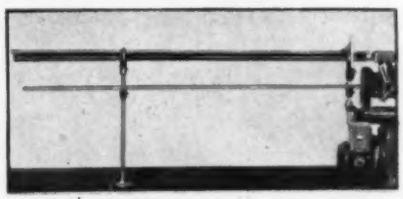


For example, the $\frac{1}{2}$-in. Utility drill is now $3\frac{1}{8}$ in. shorter and 3 lb. lighter than the previous model. The spindle and bearing features of the Van Dorn "Holgun" are incorporated in this drill, including a threaded chuck mounting; deep-groove ball-bearing spindle bearing with inner and outer races locked in place; a needle roller bearing at the back end of the spindle; splined mounting of the spindle gear for increased strength and reduced noise and wear; and a grease-sealed ball armature bearing. The motor operates on either alternating or direct current.

The other redesigned units are the $\frac{3}{8}$-in. heavy-duty, the $\frac{3}{8}$-in. Utility, the $\frac{5}{16}$-in. heavy-duty, and the $\frac{1}{4}$-in. heavy-duty electric drills. In addition, there are two newly designed drill stands—the No. 20 and the No. 40.

Silent Stock Support for Wire Feed Screw Machines

The Brown & Sharpe Co., Providence, R. I., is marketing a stock support which is designed to replace the regular stock support on B & S wire feed screw machines because it eliminates objectionable noise and vibration created by the rotation of stock in the regular stock tube. The support has a flexible metal guide, open at both ends and supported in a non-metallic casing, The casing is free to slide in

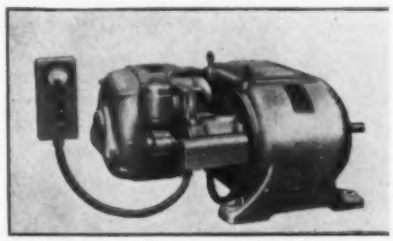


the outer support bracket and is secured to the inner support bracket by a swing latch, which prevents creeping during the operation of the machine.

A new bar is inserted in the machine end of the silent stock support by transferring the inner support bracket to the loading position stud, this stud having a vertical adjustment to assure the bar clearing the machine. With the bracket back in operating position, the new bar is then inserted in the machine spindle. The support is made in four sizes, each size being designed to take stock up to the capacity of the machine on which it is installed.

Remote Control Selects Motor Operating Speeds

An electric speed indicator has been developed by the U. S. Electrical Motors Inc., 200 E. Slauson Ave., Los Angeles, Cal., as a means for selecting the operating speed of U.S. Varidrive motors from a remote point.

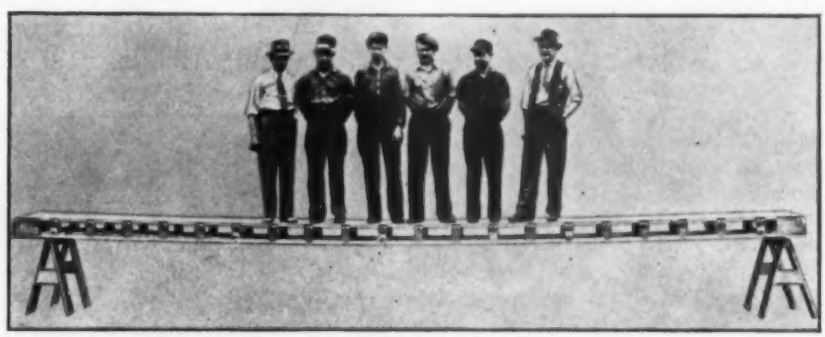


The device consists of a meter, which is the indicator proper, mounted in a box with a push button for controlling the electric pilot motor that changes the speed. The indicator is calibrated in divisions from 1 to 10. However, scales calibrated to suit requirements are obtainable.

The assembly of the indicator and push-button control in the same unit was adopted to facilitate speed adjustment, since by pushing the high or low button the speed is immediately changed; this change registers on the indicator. The remote indicator station may also be replaced by a push-button station or by automatic control equipment, such as cyclic relays, thermostats, pressure or cam mechanisms.

All-Purpose Stages Are Made of Aluminum

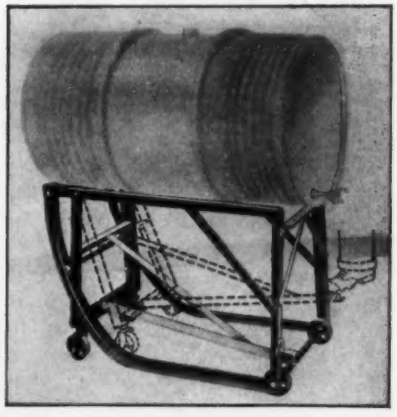
Aluminum stages for use in cleaning, painting or repairing walls and ceilings, bridging across tanks, maintenance work in factories, building operations, and, in fact, any place where it is necessary for supporting men working off ground level, have been placed on the market by the Aluminum Ladder Co., 104 Adams St., Tarentum, Pa. The stages are made in



various lengths from 8 ft. to 25 ft. and widths from 12 in. to 24 in. A stage 25 ft. long and 2 ft. wide, weighs 118 lb. All parts of the stages are bolted and riveted together, including a wood covering. They feature light weight, easy portability, and freedom from rusting or deterioration.

Drum Cradle Truck Has Long Wheelbase

Designed with an extra long wheelbase for safety and ease in moving about, the No. 50-C drum cradle truck built by the Morse Mfg. Co., 400 S. Franklin St., Syracuse, N. Y., utilizes a foot-operated lever for locking the movable caster frame

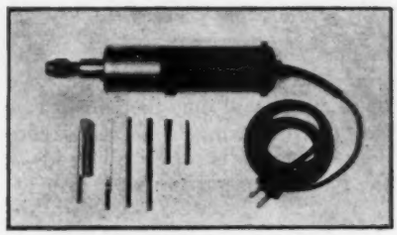


in position. This frame swings inside the curve of the rocker when the drum is rocked up, making possible the safe and easy loading of the drums.

Finishing Tool Has Reciprocating Head

A tool with a reciprocating movement to be used for taking off the last few thousandths of material in die sinking and in pattern, tool and plastic mold making—work that has always been done by hand—is announced by the H&H Research Co., 1925 W. Buena Vista, Detroit, Mich. Powered with a 110-volt universal motor and provided with a push button on the grip for instantaneous control, the tool develops a 6- to 16-lb. push at the end of the file, making its application practical for chipping, sawing, filing, honing and the removal of burrs on work which must be held to close limits.

Known as the "Hoover multi-purpose tool," it has a maximum diameter of $1\frac{5}{8}$ in. and is 8 in. long; the chuck has a $\frac{1}{8}$-in. capacity, round or square. Tools are provided for working steel, soft metal and wood. All standard machine "B" files fit the chuck, while special shapes of saws, chippers, gougers, and hones can be adapted. There are two models of the tool available, one with a $\frac{7}{16}$-in. stroke and one with a $\frac{1}{8}$-in. stroke.



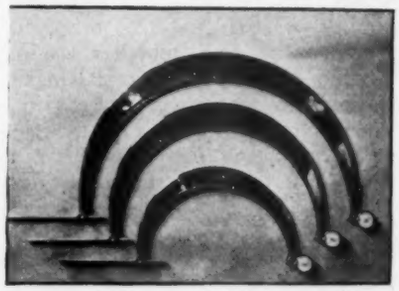
Small Welder Has a 40 to 255 Ampere Range

The P&H Hansen Model WA-200 square framed welder for multi-arc service, having a welding range from 40 to 225 amps., is now being marketed by the Harnischfeger Corporation, 4400 W. National Ave., Milwaukee, Wis. It has but two major parts—a one-piece frame and a rotating member, the latter being statically and dynamically balanced. All attachments such as external exciters, reactors, resistors, rheostats or separate stabilizers are absent.

The WA-200 welder occupies $3\frac{1}{2}$ sq. ft. of floor space and is mounted either on fixed legs or wheels for portable shop duty. The frame is of rigid construction and designed to protect bearings against misalignment and wear, and to eliminate vibration.

Tubular Micrometer Reads to 0.0005 in.

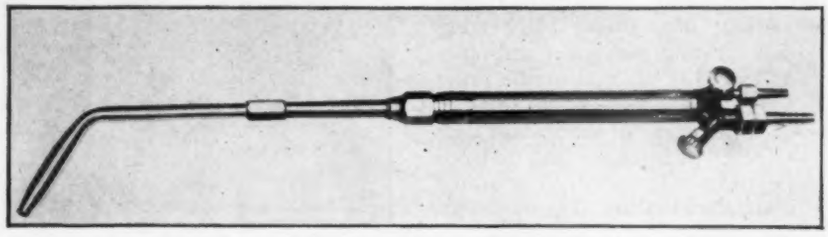
The Davis & Thompson Co., 6619 W. Mitchell St., Milwaukee, Wis., are now making their tubular micrometers with frames formed of No. 20 gage cold-drawn steel with drop forgings welded into the ends, and with dial indicators which enable the user to obtain accurate measurements to within 0.0005 in. This frame construction has been adopted for both the "Davis" bow and bar micrometers for reducing their weight, inasmuch as they range from 6-in. to 168-in. sizes for measuring large work. The bow micrometers designated as Nos. 1 to 15 range in sizes from 6 in to 96 in. The bar micrometers designated as No. 21 to 45 inclusive range from 18 in. to 168 in.; the length of the legs of the bar micrometers is either 8 or 9 in. long. Both types of micrometers can be used on either inside or outside measurement, depending upon requirements.



Blowpipe Is Designed For Heavy-Duty Work

The Type W-26 heavy-duty welding blowpipe, made by the Linde Air Products Co., 205 E. 42nd St., New York, N. Y., is designed for welding and heating ranges above those which can be handled by ordinary blowpipes. This unit delivers a tremendous amount of heat to a localized area to speed metal working and heat-treating operations. Extensions for the welding head are available.

The applications for the heavy-duty blowpipe cover a wide range, including use in the fabrication of tanks and pressure vessels, for making locomotive boilers, and for straightening



Modern METALS AND ALLOYS MAKE THEM LIGHTER-STRONGER MORE EFFICIENT

A Modern Milling Machine — the Milwaukee Simplex.

MILWAUKEE Milling Machines — like other modern equipment—are stronger and more efficient, because they are built with modern metals and alloys in accordance with the principles of modern design. The weight of a machine tool can no longer be used as a measure of value.

KEARNEY & TRECKER CORPORATION
MILWAUKEE, WISCONSIN, U. S. A.

IF IT CAN BE MILLED . . . MILL IT FASTER!

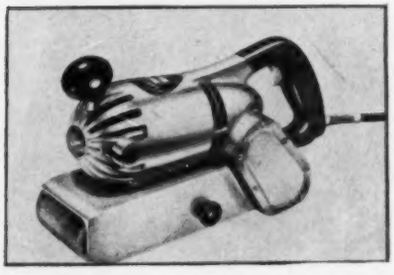
K&T

Milwaukee MILLING MACHINES

and bending ship plate, for wrinkle-bending large-diameter pipe and for similar work. It can also be used for lighter work as well as for certain flame-hardening operations.

Uniform Pressure Provided By Balanced Sander

Skilsaw, Inc., 230 N. Michigan Ave., Chicago, Ill., announces its "Zephyr-plane," a sanding tool for general maintenance work in industrial plants, which is so balanced that it provides uniform pressure over the entire sanding surface. The tool has an interchangeable knob handle that can be



moved from the top to the nose of the sander for greater convenience in sanding vertical surfaces. Also, it is equipped with a touch control lever that releases the tension on the sanding belt when changing belts. In addition, it has a pressure-control trigger switch which makes accidental starting impossible. The belt operates at a surface speed of 1,200 ft. per min. This sander, with a die-cast aluminum frame, weighs 13¼ lb.

All-Steel Platform Trucks Are Built Rigidly

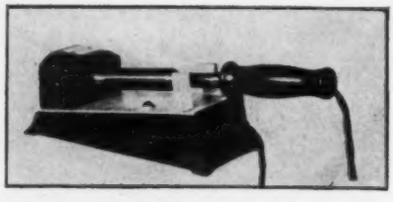
The All-Steel Welded Truck Corp., Rockford, Ill., recently announced the development of the Clark "Steel-Weld" truck, which has a perfectly smooth deck, sides which turn down 3 in., and longitudinal channel bracing. This construction permits the use of a light gage deck, but still prevents the deck from sagging under any normal load. The truck, completely fabricated by electric welding, is adaptable to use with the Clark Lift Jack, or as a flat or factory truck, having as regular standard equipment semi-steel or rubber tired wheels equipped with roller bearings and pressure grease fittings. The casters have all-steel double-row ball bearings with machine races. Standard platform sizes range from 24 in. x 48 in. to 40 in. x 72 in.

Electrodes Weld Stainless Steel

An extensive line of stainless steel welding electrodes covering many chemical analyses has been made available by the McKay Co., York, Pa. Known as "Certified Stainless Electrodes" they are claimed to produce uniform, high-quality weld deposits. The manufacturer provides in each package a certification of weld deposit analysis. Other claims include: instant contact upon re-striking arc, maximum ease of slag removal, spatter free within practical limits, smooth bead with good weld contour, all alloys contained in core wire.

Control Stand Used for Electric Soldering Irons

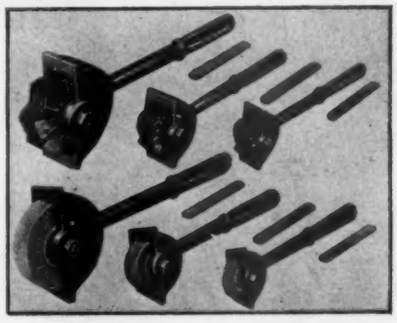
The stand for controlling the heat in electric soldering irons, developed last year by the Electric Soldering Iron Co., Deep River, Conn., is now available for use with either a.c. or d.c. current. This stand cuts the iron in and out of the circuit at any selected temperature, thereby eliminating the



possibility of burning off the tinned surface of the soldering iron tip, which would be the case if the current was not so cut off. This saves time for the operator, increases the life of the soldering iron, and effects saving in electric current.

Wheel Dressers Made In Two Styles

K. O. Lee & Son Co., Aberdeen, S. D., has developed a line of "Knock-Out" grinding wheel dressers available in both the abrasive face and corrugated wheel types. These dressers are available in diameters ranging from 2½ to 5 in. The abrasive dresser is suitable for



form wheel dressing while the corrugated type dresser is claimed to be an improvement over the usual "star" dresser and is intended principally for face dressing.

Change Gear Guard Fits Omniversal Miller

Made of aluminum alloy to keep weight at a minimum, the No. OA change gear guard offered by the Brown & Sharpe Mfg. Co., Providence, R. I., completely incloses the gearing which drives the headstock of the universal spiral index centers used on the No. O "Omniversal" milling machine. The guard is attached to the table by two screws. The full set of change gears furnished with the machine can be used, and the hinge cover swings wide to allow full freedom in changing the gears. Hand adjustment of the headstock is made by means of a crank inserted through a hole in the guard.

Hard-Surfacing Powder for Use with the Carbon Arc

A fine-grained alloyed powder to be applied with the carbon arc for hard-surfacing and designated as "Surface-weld A" has been developed by the Lincoln Electric Co., Cleveland, Ohio. This material when properly applied will give a coating with a hardness of approximately 54 C Rockwell. A deposit as thin as 0.025 in. can be applied to metal as light as 12 to 20 gage.

During the surface hardening operation, the powder is spread evenly over the area to be surfaced and to a depth of 2 to 3 times the desired thickness of the deposit. Best results are obtained by using a sharp, well-tapered carbon with negative (nor-

mal) polarity and fusing down with a weaving motion. The exact heat required will depend on the size of the work. Enough heat should be used to obtain a free-flowing puddle but not enough to dig into the base metal. Whenever possible, the arc should be weaved the full width of the desired deposit in order to build to the desired depth in one pass. If more than one pass is required, the work must be kept hot.

This hard-surfacing powder was developed to produce full hardness in the as-deposited condition, to maintain its hardness at high temperatures, to resist scaling at high temperatures and to resist softening during annealing operations.

"Glyptal Gray" Stops Lap Weld Corrosion

"Glyptal 1294 Gray" produced by the General Electric Co., Schenectady, N. Y., has been developed to prevent corrosion at the point where places overlap. It can be applied by spraying or brushing, and it is claimed that the work can be left exposed to the atmosphere until fabrication is complete without the necessity of cleaning before final welding. It also is said to prevent adhesion of weld spatter and to provide a good base for painting.

TRADE PUBLICATIONS

APPROVED EQUIPMENT The May, 1939, List of Inspected Electrical Equipment, published by the Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago, Ill., contains 430 pages listing equipment which complies with the organization's requirements.

BEARINGS Johnson Bronze Co., 508 S. Mill St., New Castle, Pa., provides specifications of a large number of stock "Ledaloyl" self-lubricating bronze bearings in Catalog L-1.

CHAIN DRIVE A four-page pamphlet, "The Progress of Roller Chain Drives," released by the Diamond Chain & Mfg. Co., Indianapolis, Ind., illustrates one- to 16-strand drive applications.

COMPRESSORS Bulletin No. 3907 AM, issued by Schramm, Inc., West Chester, Pa., describes the "Utility" line of stationary air compressors available in capacities ranging from 85 to 600 cu. ft. Operating data, detailed specifications and pictorial design features are included.

DIE STEEL A leaflet offered by the Crucible Steel Co. of America. 405 Lexington Ave., New York, N. Y., provides specifications and physical properties of "Airkool" die steel.

GEAR TESTER A folder now being distributed by the National Broach & Machine Co., Shoemaker & St. Jean Sts., Detroit, Mich., describes features of the "Red Ring" universal gear tester.

GRINDERS A series of data sheets issued by the Bergram Mechanical Engineering Co., New Britain, Conn., illustrates the features of and provides data concerning a line of utility grinders.

HOIST The "ElectroLift" worm-drive electric hoist is described in a 12-page illustrated booklet, No. 26, published by ElectroLift, Inc., 30 Church St., New York, N. Y.

MAINTENANCE An 84-page illustrated catalog published by the Ideal Commutator Dresser Co., Sycamore,

MORE PRECISION WORK
On Rivett 104
With interchangeable spindles for internal and external grinding you are always ready for MORE PRECISION WORK whether it be in the toolroom or on small lot production. The ease of set-up, wide range of adjustment and high spindle speeds have built the fame of "104" as a "work-getter" throughout this country and abroad
write for bulletin 104c
RIVETT LATHE & GRINDER INC.
Brighton, Boston, Mass.
Internal Spindle
External Spindle
RIVETT

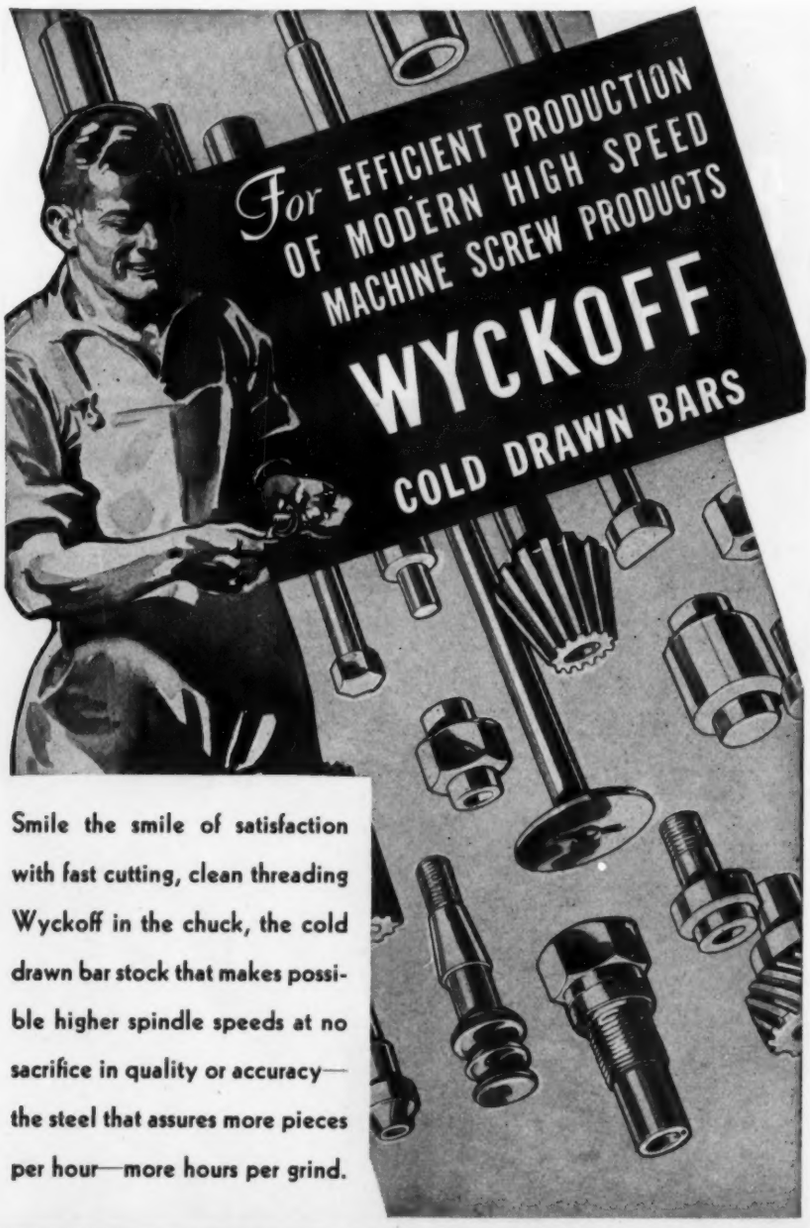
Ill., lists an extensive line of equipment for electric motor and generator maintenance and provides instructions for their care and operation.

SPEED REDUCERS Features and specifications of the "Saco" line of speed reducers are included in Catalog No. 7838, published by the Stephens-Adamson Mfg. Co., Aurora, Ill.

SWITCHBOARDS A.-c. switchboards for small plants are described in descriptive data sheet No. 31–133, issued by Dept. 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TOOL BITS Booklet No. TS 400, issued by the Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y., gives data concerning the company's new non-ferrous cast "Rexalloy" tool bits.

WELDING A slide rule giving data for both flash and spot resistance welds on various stock sizes is offered by the American Coach & Body Co., 9503 Woodland Ave., Cleveland, Ohio.



Smile the smile of satisfaction with fast cutting, clean threading Wyckoff in the chuck, the cold drawn bar stock that makes possible higher spindle speeds at no sacrifice in quality or accuracy—the steel that assures more pieces per hour—more hours per grind.

WYCKOFF DRAWN STEEL COMPANY
FIRST NATIONAL BANK BUILDING, PITTSBURGH, PENNA. — 3200 SO. KEDZIE AVENUE, CHICAGO, ILL.
Mills at Ambridge, Pa. and Chicago, Ill. . . . Warehouse Stocks in Principal Cities
Manufacturers of Carbon and Alloy Steels . . . Leaded Steels . . . Turned and Polished Shafting . . . Turned and Ground Shafting . . . Wide Flats up to 12" x 2"

NEW BOOKS

SPEED AND FUN WITH FIGURES—*By T. O'Connor Sloane, J. E. Thompson and H. E. Licks. 559 pages, 5 x 7¼ in. Clothboard binding. Published by D. Van Nostrand Company, 250 Fourth Ave., New York, N. Y. Price, $3.50.*

There are a lot of interesting things about figures that are not taught in the classroom. Most students of school arithmetic find it lacking in fun, and the element of speed is usually missing, too.

But the authors have proved that there is speed and fun in figures. They present in one book three subjects each of which is really a volume in itself.

The first deals with short-cut methods for rapid calculation. Most of us know one way to add, giving little thought to the fact that there are at least a dozen methods. The author of this section explains these and the various other little known characteristics of figures which aid in making them fall into line with amazing speed.

The second section deals with the slide rule. Those who use slide rules a good deal have found that many short cuts are available beyond the usual directions given in manufacturers' booklets. Here the various tricks of slide rule manipulation are explained in a way that is sure to be suggestive of time-saving steps.

Amusement is the objective of the third section. We all are familiar with a few mathematical tricks and puzzles, but we do not ordinarily realize that practically all branches of mathmetics are a source of recreation. Many examples are given in this section. Some are serious, others frivolous, but all will serve to find entertainment in a subject that is too often considered a chore.

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MACHINE DESIGN—*By Stanton G. Winston, associate professor of mechanical engineering, Armour Institute of Technology. 333 pages, 5½ x 8¼ in. Clothboard binding. Indexed and illustrated. Published by the American Technical Society, Drexel Ave. at 58th St., Chicago, Ill. Price, $3.00.*

Many textbooks have been written on the subject of machine design. Professor Winston follows customary practice of selecting machine elements that are more or less common to a wide range of mechanical de-

signs. He explains the general functions of these elements and gives attention to analysis of the stresses to which they are subjected.

After a discussion of the underlying principles of machine construction, the author takes up in detail such items as bolts and screws, riveted joints, shafting and keys, couplings and clutches, gear drives and other elements of machine design. Each chapter is followed by a set of problems by means of which the student can test his own understanding of the principles set forth. The main emphasis of the volume is on how to apply machine design principles to every-day practice. The mathematics have been kept simple, presupposing a knowledge of trigonometry and logarithms but not of the calculus.

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TOOL MAKING—*By Charles Bradford Cole, president, Tool Equipment Sales Company, Chicago. 413 pages, 5¼ x 8¼ in. Clothboard binding. Indexed and illustrated. Published by American Technical Society, Drexel Ave. at 58th St., Chicago, Ill. Price, $3.50.*

In this "how to do it" book, the author discusses the use and care of tools and equipment employed by the toolmaker, and then discusses the processes used in making typical tools of various types. While this volume will be of most value to beginners, the experienced artisan will find much usable information in its pages. In the appendix are data on American standard screw threads, with tables of general dimensions for both the fine-thread and the coarse-thread series. Line drawings and photographs are used throughout the book to illustrate types of tools used, and points in the art of tool-making.

Welding Inconsistencies

By J. F. LINCOLN
President, The Lincoln Electric Company

The Interstate Commerce Commission insists that to weld a tank car which carries liquids at no pressure is dangerous. The fact that the tanks into which the oil goes from these tank cars must be welded to remove the chance of leakage does not affect them. The further fact that this oil was distilled at a pressure of over 1,000 lb. per sq. in. at over 1,000 deg. F. in an arc welded vessel disturbs them not at all.

The Commission still insists that a locomotive boiler cannot be welded although the locomotive superheater which carries the same steam pressure at a higher temperature in the same boiler must be welded.

Authorities still insist that the skin of a ship shall not be welded in spite of the fact that the boilers inside the ship, carrying very high pressures, are welded. They still insist that many pressure vessels must be riveted because of the danger to life and yet 30,000,000 automobiles in this country depend for their success on untested welds. The failure of any automobile weld would result in a much greater loss of life than would be true of failure of many pressure vessels. Despite all these facts welding is condemned or so restricted as to eliminate its economies.

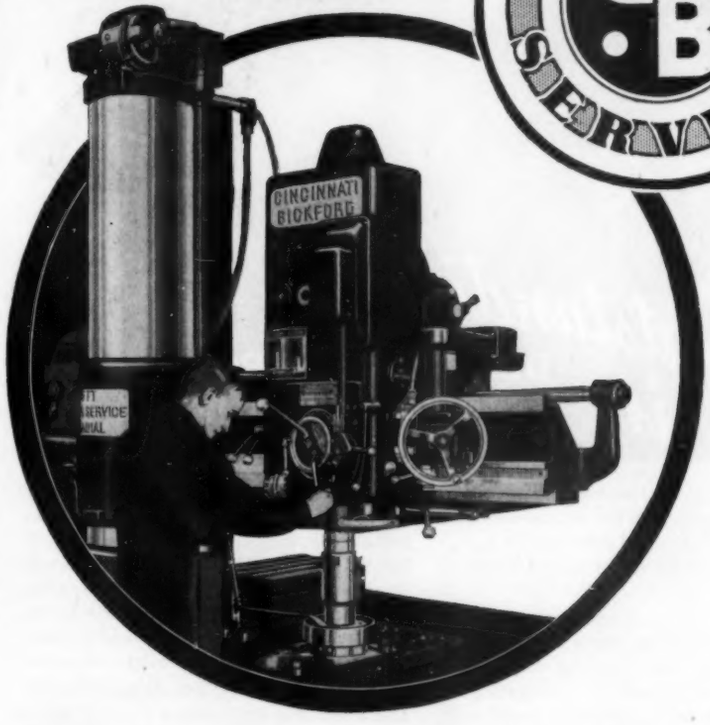
Suggestions for Using Carbide Tipped Tools

By C. G. WILLIAMS

A strongly built machine, operated with as little vibration as possible and having sufficient power for the high speeds needed, is a basic condi-

36 SPEEDS-
18 FEEDS

SUPER C B SERVICE



Each For A Definite Use

36 speeds and 18 feeds—all in geometric progression and so closely graded that each tool can be operated at the dollar-saving limit of its endurance. There is no duplication or overlapping in the Super-Service speed and feed ranges.

For drilling, boring, tapping, facing and reaming—holes of many sizes and in materials from tough alloy steels to cast iron and aluminum—Super-Service Radials merit your consideration on the basis that, at all times, they produce "More Holes Per Dollar."

Detailed specifications are contained in Bulletin R-24. Write for your copy . . . Today!

THE CINCINNATI BICKFORD TOOL CO.
OAKLEY CINCINNATI OHIO U.S.A.

tion for efficient machining with sintered carbide-tipped tools. This does not mean that carbides may not be used on belt-driven machines at high rates of efficiency, providing a tool holder be put on the cross slide and a ball or roller bearing center be used in the tailstock spindle.

Do not use a single-screw toolpost, as it is a common source of tool-tip vibration. The tool should have as little overhang as possible, one-half the tool depth should be sufficient. Have the machine running at full speed before approaching the tool to the cut; at the end of the cut throw out the feed and let the cut run out before stopping the machine. Starting the machine with the tool against the work and the feed engaged, as well as stopping the machine with the tool in the cut or stalling the machine will cause the tip to break.

If possible, do not use a coolant when cutting with carbide-tipped tools. Such a tool will stand a much higher heat and still hold its cutting edge than will high-speed steel tools. If for any reason it seems advisable to use a coolant, a very heavy flow should be maintained. In such cases, about four to five times the volume of coolant as required for high-speed steel tools should be used. A light or intermittent flow which may suddenly throw a quantity of coolant on the hot tip will cause the carbide to crack. The coolant stream must be directed onto the point of the tool.

Always set a carbide tipped tool so that the point will be below the center of the work; but not more than 0.010 in. below the center. When the tool is set on or above center it causes an undue amount of pressure on the front of the tool that increases wear and may cause a chip to spall off the top of the tip during the cut.

Carbide-tipped tools should be reground before the wear on the front of the tool exceeds 0.015 in. Do not use a coolant when grinding, as wet grinding will cause checks in the edge of the tool. Grind by hand with a light pressure on a silicon carbide wheel. Heavy pressures cut away the wheel without increasing the cutting action on the tip.

Grinding wheels for sharpening carbide-tipped tools should be kept straight and open. Do not allow the wheel to glaze, as this generates heat and lessens cutting action. The heat may cause cracks in the edge of the tool which will spread. Do not dip the tool into water, as the quick change of temperature will cause the carbide to crack.

Grind the front or cutting side of the tool first, then side surfaces and, if necessary, touch up the top surface. Use a No. 60 grit wheel for roughing and a No. 120 grit wheel for finishing. Lap with a No. 200 grit hand hone to finish. All finish ground tools, whether ground on a silicon carbide wheel or lapped on a diamond wheel, should be hand honed to remove unsupported carbide crystals along the cutting edge. This prevents a destructive wedging effect of the loose carbide crystals into the binder between adjacent crystals of carbide which would start cracks in the cutting edge of the tip. Frequent honing of the tool during use increases the efficiency and life of the tip many fold.

In cutting steels or other metals that give a long stringy chip, a chip breaker may be ground in the top of the tip. This breaker, however, should not be over $\frac{1}{32}$ in. deep at any time. When the tool wears at the cutting edge, do not grind the chip breaker deeper, but grind back to maintain the original contour. On very hard materials, a negative top rake, either on the tip or in the chip breaker, will give added efficiency and life to the tool.

Ever since Oilgear pioneered the hydraulic broaching machine, it has led the way with a constant advance of outstanding developments both in fluid power and machine design.

Illustrated above is one such improvement. Already in the plants of leading industrials, the new Oilgear Horizontal Broaching Machines are providing increased production, at lower costs, with much less tool breakage and far longer tool life.

These machines provide variable cutting speeds up to 37 feet per minute and independently adjustable return speeds up to 100 feet per minute. They provide the most modern simplified push-button control, resulting in easier operation and less fatigue to the operator. Alternate to that, a toe lever switch frees the operator's hands for the work and the tool. In addition there is protection against overload and convenient emergency stop button. There is ample space for performing both internal and external broaching operations. Oilgear "DX" two-way variable displacement pumps with double solenoid pilot controls supply cushioned fluid power. All hand and foot levers, links, springs, pins, etc. required in previous control devices have been eliminated.

Oilgear Horizontal Broaching Machines are available in 9 sizes from 6000 to 100,000 lbs. normal broaching capacity; from 36" to 72" broaching stroke. 150% overload capacity increases the range from 9000 to 150,000 lbs. peak tool capacity.

In every way the new Horizontal Broaching Machines are characteristic of the advances in design and performance which have always made Oilgear the preferred equipment in leading plants. Write for further specifications. THE OILGEAR COMPANY, 1301 W. Bruce St., Milwaukee, Wisconsin.

OILGEAR
BROACHING MACHINES AND PRESSES